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REPORT

OF THE

UNITED STATES COMMISSIONER OF FISHERIES

FOR THE FISCAL YEAR 1918

WITH

APPENDIXES

HUGH M. SMITH
Commissioner

WASHINGTON
GOVERNMENT PRINTING OFFICE
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REPORT OF THE
UNITED STATES COMMISSIONER OF FISHERIES
FOR THE FISCAL YEAR ENDED
JUNE 30, 1918

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REPORT

OF THE

COMMISSIONER OF FISHERIES.

DEPARTMENT OF COMMERCE,
BUREAU OF FISHERIES,
Washington, September 30, 1918.

SIR: I have the honor to submit herewith a report in which are outlined the operations of the Bureau of Fisheries during the fiscal year ended June 30, 1918. The major divisions, into which the report naturally falls, are general administrative matters, the propagation and distribution of food fishes, the artificial propagation of fresh-water mussels, the Bureau's relations with the fishing industry, biological and physical investigations and experiments, the Alaska fisheries service, the Alaska fur-seal service, protection of the minor fur-bearing animals of Alaska, and miscellaneous activities and relations.

GENERAL ADMINISTRATIVE MATTERS.

ADAPTATION TO WAR CONDITIONS.

The Bureau has continued to conduct its operations with reference to the peculiar situation created by war, and has actively cooperated with other governmental agencies—Army, Navy, Food Administration, War Trade Board, Shipping Board, Fuel Administration, etc.—in furthering the country's interests so far as its powers and resources permit. This has resulted in a curtailment of activities in certain lines, but in essential respects has given to the operations an importance never before assumed.

Seagoing vessels of the Bureau suitable for naval purposes have been placed at the disposal of the Navy Department and are rendering good service. The Navy Department has taken over the entire plant of the marine biological station at Beaufort, N. C. The extensive docks and spacious buildings at the marine station at Woods Hole, Mass., have been largely and constantly used as headquarters for a naval-reserve force.

The estimates of appropriations for 1920 have been submitted with reference to urgent conditions, which make unwise the expenditure of any moneys not actually required for operations on a war basis. Under other circumstances, larger appropriations would have been requested; and, in due time, such funds as the Bureau needs for the proper performance of its functions and the fulfillment of its obligations to the country will be estimated for and strongly urged before Congress, which in the past has dealt with this service in a liberal manner.

PERSONNEL.

The personnel of the Bureau, both at headquarters and in the field, has performed with efficiency and fidelity the ordinary duties devolving thereon, and, furthermore, has assumed in admirable spirit the added personal, official, and civic responsibilities imposed by the state of war. Throughout the Bureau, employees have freely offered themselves for active military duty; a comparatively large number have entered the Army and Navy; and in the relatively few cases in which deferred classification has been asked, the Bureau, rather than the employees themselves, has taken the initiative in recognition of certain definite needs of the fishery service. It is an honor no less than a pleasure to commend to the Secretary a loyal, capable corps of technical and clerical assistants, both permanent and temporary, to whom is to be attributed the success of the Bureau's operations and the enlarged scope and increasing public appreciation of its activities.

The administrative staff at headquarters during the fiscal year 1918 comprised the following persons: H. F. Moore, deputy commissioner; Irving H. Dunlap, assistant in charge of office; Henry O'Malley, assistant in charge of fish culture; Robert E. Coker, assistant in charge of inquiry respecting food fishes and the fishing grounds; Lewis Radcliffe, assistant in charge of statistics and methods of the fisheries; Ward T. Bower, chief agent of the Alaska service. At the beginning of the fiscal year 1919, Mr. O'Malley was transferred to the position of field assistant for the Pacific coast, a place newly created by Congress, and Glen C. Leach, field superintendent and an employee of the fish-cultural branch since 1902, became assistant in charge of the division.

The Bureau has long been handicapped by the extremely small salaries allowed by Congress in the lower grades, particularly in the clerical and fish-cultural forces. In recent years, and particularly in the fiscal year 1918, the situation has become acute because of the difficulty, often the impossibility, of inducing persons to accept statutory positions or of retaining persons who may have been willing to enter the service. The result is that a very large proportion of the low-grade positions in the fish hatcheries has been vacant much of the time, and there has been in the Washington office a floating corps of clerks, many of them appointed without regard to civil-service qualifications. The entrance salaries in the fish-cultural branch are so low as to be almost absurd under present industrial conditions. The clerical service is overcrowded at the bottom, and there is little opportunity for advancing capable and deserving juniors.

As a move toward the remedying of this situation, there has been included in the estimates of appropriations for 1920 provision for the substitution of a reduced number of higher-grade clerical positions in lieu of certain low-grade positions and for general increase in the salaries of the field force in the fish-cultural branch.

Other recommendations affecting personnel that have been placed in the estimates of appropriations for the next fiscal year are as follows: Increase in the salaries of assistants in charge of divisions; creation of a chief of the Alaska service; provision for eight additional technical assistants for work in fish culture, biological investigation, and commercial fisheries; provision for two new statistical

agents for canvassing the fisheries; a clerk to the deputy commissioner and a clerk for the Seattle office; change in designation and increase in salary of the principal Government officials on the Pribilof Islands; provision for personnel of the station at Block Island, R. I.; and an alternative estimate for the segregation of the different grades of all field employees, in lieu of detailed estimate by stations, cars, etc., as at present, in the interest of a more elastic force that can be more economically employed.

APPROPRIATIONS AND ALLOTMENTS.

The appropriations for the Bureau of Fisheries for the fiscal year 1918, including regular, deficiency, and special appropriations, aggregated $1,263,560, as follows:

Salaries, including $8,000 deficiency for steamer *Roosevelt*	$440,560
Miscellaneous expenses:	
Administration	10,000
Propagation of food fishes	375,000
Maintenance of vessels	90,000
Inquiry respecting food fishes	50,000
Statistical inquiry	7,500
Protecting sponge fisheries	3,000
Protecting seal and salmon fisheries of Alaska, including deficiency of $35,000	110,000
Developing aquatic sources of leather	10,000
Repairs, steamer *Fish Hawk*	35,000
Distribution cars	15,000
Motor vessel for Woods Hole, Mass	3,000
Rebuilding laboratory, Fairport, Iowa (deficiency)	80,000
Improvements and purchase of land at fish-cultural stations:	
Cape Vincent, N. Y	5,500
Edenton, N. C	3,500
San Marcos, Tex	7,500
Improvements at fish-cultural stations:	
Bozeman, Mont	7,500
Orangeburg, S. C	3,500
Saratoga, Wyo	7,000

A detailed statement of the expenditures under the foregoing appropriations will be submitted in accordance with law.

In addition to the amounts appropriated by Congress, there were provided for the extension of the Bureau's activities certain allotments from the fund for the national security and defense. These allotments, approved and authorized by the President on the recommendation of the Secretary, have enabled the Bureau to undertake important work that otherwise would have been altogether impossible or possible on only a limited scale.

The first allotment, amounting to $30,000, was made on January 2, 1918, for the purpose of securing an immediate increase in the production of aquatic foods on all parts of the United States coast, through such educational and publicity methods as have heretofore proved successful.

The second allotment, of $20,000, was given on February 27, 1918, to enable the Bureau to cooperate with the Food Administration and the State fishery authorities in increasing the production of food fish in the Gulf States.

On April 9, 1918, an allotment of $25,000 was provided for the purpose of enabling the Bureau to install at the Pribilof Islands a plant for the utilization of seal carcasses in producing a commercial

grade of oil and fertilizer. It was represented that, by the use of material that would otherwise be wasted, valuable by-products would result that would pay for the plant in the first season of its operation.

On July 2, 1918, pursuant to a formal presentation of the matter on June 23, 1918, the President allotted $125,000 to permit the erection and maintenance of a fisheries-products laboratory in Washington, D. C. The primary purpose of the laboratory is to induce increased production and consumption of aquatic foods through the dissemination of knowledge of improved methods of preservation.

PROPAGATION AND DISTRIBUTION OF FOOD FISHES.

PROGRESS OF FISH CULTURE.

The general trend and progress of Federal fish culture may be regarded as satisfactory. Some of the great commercial fisheries which, because of their magnitude and intensity, have a constant tendency to affect adversely the abundance of the fishes sought have been brought well within the control of the fish-culturist and may, in general, be maintained at a high level because of the advances that have been made in artificial propagation, supplemented by minimum rational restrictions.

Other fisheries, of which the lobster and sturgeon are conspicuous examples, have long been prosecuted in such flagrant and notorious disregard of the laws of nature and of man that artificial propagation seems hopeless, and dependence thereon only serves to condone pernicious practices. An exception should, of course, be made in the case of lobster rearing which, if conducted on a sufficiently extensive scale in the principal centers of the lobster fishery, and supported by local popular sentiment in favor of lobster conservation, would undoubtedly do much to arrest the decline and restore depleted waters.

Of the littoral marine fishes that have come under artificial propagation, the winter flounder is most extensively hatched and supports the largest fishery. It is most worthy of continued attention at the hands of the fish-culturist, because of its inherent qualities and because its abundance may readily be affected, favorably or unfavorably, by man.

Judged by mere numbers, the fish-cultural work of the Bureau in the fiscal year 1918 showed a decrease of approximately 20 per cent compared with 1917. The aggregate output of the hatcheries was 4,098,105,000. The smaller production was chiefly attributable to adverse weather conditions prevailing during the spawning time of various commercial fishes whose eggs are handled in large numbers, particularly the cod, pollock, and pike perch. Other species which showed a reduced output were shad, cisco, humpback and chum salmons, lake trout, smelt, white perch, and lobster. An increase is to be noted in the production of buffalofish, carp, catfish, whitefish, chinook and sockeye salmons, yellow perch, and winter flounder.

From the very nature of the fish-cultural work, the young of some of the species hatched are planted as fry, and this will no doubt continue to be the practice for many years to come, perhaps indefinitely. The fishes so handled are those whose eggs are obtained in comparatively large numbers from the commercial fishermen and whose fry have a very short yolk-sac stage, common examples being the whitefish, shad, pike perch, yellow perch, striped bass, and vari-

ous marine species. Other fishes, however, which in the early days of fish culture also were planted soon after hatching, are now being held for longer and longer periods as the facilities for rearing are improved; and a conspicuous feature of the recent operations is the greatly increased percentage of fishes liberated as fingerlings and yearlings. The fishes which require this treatment are the salmons and trouts, which have a large, slowly absorbed yolk-sac, the carrying of which renders them more or less helpless and a ready prey to their natural enemies, and the fresh-water basses, which are especially adapted for pond culture. In the fiscal year 1918, over 168,000,000 fish were distributed by the Bureau as fingerlings, yearlings, and adults, this being by far the largest output of such fish, both in actual number and in percentage. The year 1917, which established a record in this respect, showed only 82,000,000 fishes distributed as fingerlings, yearlings, and adults. It should be understood that fishes stranded on the overflowed lands along the Mississippi River and tributaries and rescued by the Bureau's agents are included in the foregoing figures.

There follows a summarized statement of the output of the Bureau in 1918:

SUMMARY, BY SPECIES, OF THE DISTRIBUTION OF FISH AND FISH EGGS DURING THE FISCAL YEAR 1918.

Species.	Eggs.	Fry.	Fingerlings, yearlings, and adults.	Total
Catfish			12,733,330	12,733,330
Carp		3,250,000	1,660,941	4,910,941
Buffalofish		28,260,000	2,417,052	30,677,052
Shad		52,543,900		52,543,900
River herring		100,000	3,700,000	3,800,000
Whitefish	75,540,000	408,492,000		484,032,000
Lake herring (cisco)		65,130,000		65,130,000
Silver salmon		980,300	10,534,115	11,514,415
Chinook salmon	17,574,900	6,028,920	63,176,244	86,780,064
Sockeye salmon	13,000,000	38,137,000	45,599,785	96,736,785
Humpback salmon		5,193,065	3,754,000	8,947,065
Chum salmon		9,892,145		9,892,145
Steelhead salmon	1,570,000	172,000	7,022,488	8,764,488
Rainbow trout	1,139,250	22,000	1,654,477	2,815,727
Atlantic salmon		2,577,000	671	2,577,671
Landlocked salmon	478,000	306,395	87,837	872,232
Blackspotted trout	1,090,000	3,821,000	1,878,500	6,789,500
Loch Leven trout			56,000	56,000
Lake trout	21,718,000	39,599,200	226,797	61,543,997
Brook trout	378,175	3,876,265	7,882,668	12,137,108
Sunapee trout			7,372	7,372
Smelt		1,218,750		1,218,750
Pike and pickerel			106,408	106,408
Fresh-water drum			83,473	83,473
Crappie			2,905,812	2,905,812
Largemouth black bass		283,500	970,020	1,253,520
Smallmouth black bass		172,500	155,674	328,174
Rock bass			83,055	83,055
Warmouth bass			9,220	9,220
Sunfish			1,644,558	1,644,558
Pike perch	14,560,000	56,000,000	1,954	70,561,954
Yellow perch		182,899,000	459,282	183,358,282
White perch		2,900,000		2,900,000
White bass			47,261	47,261
Striped bass		14,349,000		14,349,000
Mackerel		4,648,000		4,648,000
Cod		77,659,000		77,659,000
Pollock		233,700,000		233,700,000
Haddock		17,830,000		17,830,000
Winter flounder		2,455,371,000		2,455,371,000
Miscellaneous fishes			100,200	100,200
Lobster		66,680,000	5,700	66,685,700
Total	147,048,325	3,782,091,940	168,964,894	4,098,105,159

HATCHERIES OPERATED.

No new hatcheries were in operation during the year. The hatchery near Havre de Grace, Md., at the mouth of the Susquehanna River, closed by order of the Secretary in the last fiscal year, has remained closed. The Bureau is not informed of any action taken by the Maryland Legislature that would justify the reopening of this station. The equipment has been largely removed for use in other fields. The station at San Marcos, Tex., closed by order of the Secretary in May, 1917, was reopened July 1, 1918, the Texas Legislature having in March, 1918, enacted a law to meet the requirements imposed by Congress. Following is a list, in alphabetical order, of the fish-cultural stations operated during the year, with the principal auxiliary or subsidary stations thereunder, the period of active work, and the species handled. The numerous minor field stations and mere egg-collecting points are not shown.

Congress has provided a permanent personnel for the Berkshire trout hatchery, and regular operations thereat have begun. Although the donation of this valuable property was formally accepted by the Government in July, 1916, the Department of Justice has not yet made the report on the title, as required by law, so that the Bureau has not been able to assume formal control.

FISH-CULTURAL STATIONS AND PRINCIPAL AUXILIARIES OPERATED DURING THE FISCAL YEAR, 1918.

Designation.	Period of operation.	Species handled.
Afognak, Alaska	Entire year	Sockeye and humpback salmons.
Seal Bay, Alaska	July-October	Do.
Atchafalaya, La	March-April	Buffalofish.
Baton Rouge, La	April-May	Black bass, buffalofish, carp, catfish, crappie, drum, sunfish, white bass.
Baird, Cal	Entire year	Chinook salmon.
Battle Creek, Cal	do	Do.
Mill Creek, Cal	do	Do.
Hornbrook, Cal	do	Chinook salmon, rainbow trout.
Baker Lake, Wash	do	Sockeye, chinook, and silver salmons.
Birdsview, Wash	do	Sockeye, chinook, chum, humpback, silver, and steelhead salmons.
Brinnon, Wash	July-February	Chum, humpback, and steelhead salmons.
Darrington, Wash	do	Chinook, chum, humpback, silver, and steelhead salmons.
Day Creek, Wash	July-May	Chinook, chum, and steelhead salmons.
Duckabush, Wash	Entire year	Chum, humpback, silver, and steelhead salmons.
Illabott Creek, Wash	July-January	Chinook, chum, humpback, silver, and steelhead salmons.
Quilcene, Wash	Entire year	Chum, humpback, silver, and steelhead salmons.
Sultan, Wash	do	Chinook, humpback, silver, and steelhead salmons.
Berkshire, Mass	do	Brook and rainbow trouts, steelhead salmon.
Boothbay Harbor, Me	do	Flounder, lobster.
Bozeman, Mont	do	Blackspotted, brook, and rainbow trouts.
Meadow Creek, Mont	March-June	Rainbow trout.
Yellowstone Park, Wyo	July, August, and June	Blackspotted trout.
Bryans Point, Md	March-May	Shad, yellow perch, alewife.
Cape Vincent, N. Y	Entire year	Brook, lake, and rainbow trouts, lake herring, pike, and yellow perches, whitefish.
Central station, Washington, D. C	do	Black bass, brook trout, humpback, salmon, shad, sunfish, whitefish.
Clackamas, Oreg	do	Blackspotted, brook, and rainbow trouts, chinook, silver, and steelhead salmons.
Applegate, Oreg	do	Chinook, silver, and steelhead salmons.
Big White Salmon, Wash	do	Chinook, salmon.
Little White Salmon, Wash	do	Do.
Rogue River, Oreg	do	Blackspotted trout, chinook, silver, and steelhead salmons.
Upper Clackamas, Oreg	do	Rainbow trout, chinook, silver, and steelhead salmons

FISH-CULTURAL STATIONS AND PRINCIPAL AUXILIARIES OPERATED DURING THE FISCAL YEAR, 1918—Continued.

Designation.	Period of operation.	Species handled.
Clackamas, Oreg.—Contd.		
Willamette, Oreg.	July, May, and June	Shad.
Astoria, Oreg.	do	Do.
St. Helens, Oreg.	do	Do.
Cold Springs, Ga.	Entire year	Black bass, catfish, sunfish.
Craig Brook, Me.	do	Atlantic, humpback, and landlocked salmons, brook trout.
Duluth, Minn.	do	Brook and lake trouts, pike perch, whitefish.
Edenton, N. C.	do	Black bass, shad, sunfish, yellow perch.
Weldon, N. C.	April-May	Striped bass.
Erwin, Tenn.	Entire year	Brook and rainbow trouts, black bass, carp, rock bass, sunfish.
Fairport, Iowa	do	Black bass, buffalofish, carp, catfish, crappie, drum, pike sunfish, white bass yellow perch.
Gloucester, Mass.	do	Cod, flounder, haddock, pollock.
Green Lake, Me.	do	Brook and lake trouts, landlocked salmon smelt.
Grand Lake Stream, Me.	do	Lake trout, landlocked salmon, white perch.
Homer, Minn.	do	Black bass, buffalofish, carp, catfish, crappie, pike perch, pike, rock bass, sunfish white bass, yellow perch.
La Crosse, Wis.	do	Black bass, buffalofish, carp, catfish, crappie, drum, pike, white bass, pike and yellow perches, brook and rainbow trouts.
Leadville, Colo.	do	Blackspotted, brook, lake, Loch Leven, and rainbow trouts.
Louisville, Ky.	do	Brook and rainbow trouts, black bass, crappie, pike perch, rock bass, smallmouth bass, sunfish.
Mammoth Spring, Ark.	do	Black bass, rock bass.
Manchester, Iowa	do	Brook and rainbow trouts, crappie, rock bass, smallmouth bass.
Bellevue, Iowa	July-December	Black bass, buffalofish, carp, catfish, crappie, drum, pike, river herring, sunfish, warmouth bass, white bass, yellow perch
North McGregor, Iowa	do	Do.
Meredosia, Ill.	do	Black bass, buffalofish, carp, catfish, crappie, drum, rock bass, smallmouth bass sunfish, yellow perch.
Nashua, N. H.	Entire year	Brook and rainbow trouts, landlocked salmon, smallmouth bass.
Neosho, Mo.	do	Black bass, crappie, rock bass, smallmouth bass, sunfish, yellow perch, rainbow trout.
Northville, Mich.	do	Brook, lake, and rainbow trouts, small mouth bass, steelhead salmon
Alpena, Mich.	October-March	Lake trout, whitefish.
Charlevoix, Mich.	November-June	Lake trout, steelhead salmon, whitefish
Orangeburg, S. C.	Entire year	Black bass, sunfish.
Put in Bay, Ohio	do	Carp, lake trout, pike perch, whitefish
Quinault, Wash.	do	Sockeye, chinook, and silver salmons.
St. Johnsbury, Vt.	do	Brook, lake, rainbow, and sunapee trouts, landlocked and steelhead salmons, smallmouth bass.
Holden, Vt.	do	Brook and lake trouts, landlocked and steelhead salmons.
Swanton, Vt.	April-June	Pike and yellow perches.
Saratoga, Wyo.	Entire year	Blackspotted, brook, and rainbow trouts, steelhead salmon.
Spearfish, S. Dak.	do	Blackspotted, brook, lake, and rainbow trouts.
Springville, Utah	do	Blackspotted, brook, and rainbow trouts.
Tupelo, Miss.	do	Black bass, crappie, sunfish warmouth bass.
Friar Point, Miss.	July-December	Black bass, catfish, crappie, rock bass, sunfish.
White Sulphur Springs, W. Va.	Entire year	Brook and rainbow trouts, smallmouth bass.
Woods Hole, Mass.	do	Cod, flounder, mackerel.
Wytheville, Va.	do	Brook and rainbow trouts, black bass, rock bass, smallmouth bass, sunfish.
Yes Bay, Alaska	do	Sockeye salmon.

DISTRIBUTION OF FOOD FISHES.

The food fishes produced at the Bureau's stations and assigned to private applicants, State fishery authorities, or public waters, received a nation-wide distribution.

The 6 special cars employed in distributing the output in 1918 traveled 102,330 miles, of which 10,024 miles were without cost to the Bureau. The remaining mileage was at a cost of 10 to 25 cents per mile, which includes moving of cars and fares of attendants. Car messengers, detached from their cars and charged with special shipments of fish, traveled 468,244 miles, of which 54,578 miles were free and the remainder at 2 to 4 cents per mile. The cars were hauled over 47 railroads and the messengers traveled on 190 different railroads.

Poor service rendered by express companies during the year, owing in part to railway congestion and in part to neglect of explicit instructions, resulted in the loss of various shipments of fish eggs to State fishery authorities and between stations of the Bureau.

RELATIONS WITH STATES AND FOREIGN COUNTRIES.

In cooperation with the fishery authorities of the various States, the Bureau has continued to supply considerable numbers of fish eggs for incubation in State hatcheries, the resulting fish being planted in local waters under the direction of the State commissioners. Limited numbers of fry, fingerlings, yearlings, and adults also are furnished to the States. In 1918 this form of cooperation was extended to 27 States, as follows:

ALLOTMENTS OF FISH AND FISH EGGS TO STATE FISH COMMISSIONS, FISCAL YEAR 1918.

[All figures are for eggs unless otherwise indicated. Fingerlings are designated *a* and fry *b*.]

State and species.	Number.
California: Chinook salmon	14,321,900
Connecticut:	
Largemouth black bass	*a* 515
Catfish	*a* 750
Crappie	*a* 1,500
Sunfish	*a* 2,400
Illinois:	
Largemouth black bass	*a* 825
Catfish	*a* 12,200
Crappie	*a* 21,850
Lake trout	100,000
Pike and pickerel	*a* 688
Sunfish	*a* 9,730
White bass	*a* 2,665
Whitefish	5,000,000
Yellow perch	*a* 2,575
Iowa:	
Brook trout	50,000
Lake trout	50,000
Rainbow trout	94,000
Kentucky:	
Brook trout	*a* 600
Pike perch	*b* 2,400,000
Rainbow trout	*a* 1,600
Maine:	
Brook trout	100,000
Lake trout	100,000
Landlocked salmon	378,000
Maryland:	
Catfish	*a* 180
Crappie	*a* 200
Smallmouth black bass	*a* 88
Massachusetts: Pike perch	5,000,000
Michigan: Lake trout	2,550,000
Minnesota:	
Lake trout	300,000
Steelhead salmon	50,000
Montana:	
Blackspotted trout	300,000
Largemouth black bass	*a* 1,400
Catfish	*a* 3,000
Rainbow trout	300,000
Sunfish	*a* 100
Nebraska: Rainbow trout	*a* 16,000
Nevada:	
Blackspotted trout	50,000
Rainbow trout	50,000
New Hampshire:	
Lake trout	100,000
Pike perch	2,000,000
Whitefish	500,000
New Jersey:	
Largemouth black bass	*a* 200
Landlocked salmon	25,000
Rainbow trout	50,000
Steelhead salmon	50,000
New York:	
Lake trout	11,766,000
Landlocked salmon	50,000
Steelhead salmon	400,000
Whitefish	15,000,000
Ohio: Lake trout	700,000
Oklahoma:	
Rock bass	*a* 1,550
Sunfish	*a* 1,550
Yellow perch	*a* 100 *b* 10,000
Oregon:	
Brook trout	*a* 36,000
Chinook salmon	3,150,000
Sockeye salmon	3,000,000
Steelhead salmon	750,000
Pennsylvania: Whitefish	38,280,000

ALLOTMENTS OF FISH AND FISH EGGS TO STATE FISH COMMISSIONS, FISCAL YEAR 1918—Continued.

State and species.	Number.	State and species.	Number
Rhode Island:		Washington:	
Brook trout	50,000 [a] 20,000	Blackspotted trout	200,000
Smallmouth black bass	[a] 690	Lake trout	300,000
South Dakota:		Wisconsin:	
Largemouth black bass	[a] 1,050	Largemouth black bass	[a] 3,425
Brook trout	[a] 6,000	Catfish	[a] 900
Catfish	[a] 12,300	Crappie	[a] 1,200
Crappie	[a] 2,200	Lake trout	5,402,000
Sunfish	[a] 5,100	Whitefish	15,000,000
Tennessee:		Wyoming:	
Brook trout	25,000	Blackspotted trout	200,000
Rainbow trout	100,000	Rainbow trout	50,000
Vermont:		Steelhead salmon	50,000
Lake trout	300,000		
Landlocked salmon	10,000	Total	133,307,900 [b] 2,410,000 [a] 170,771
Pike perch	7,056,000		
Steelhead salmon	50,000		

In various fields the agents of the Bureau and the different States have joined forces in the collection of eggs. The States, on their part, have facilitated the fish-cultural work of the Bureau, and an excellent cooperative spirit prevails throughout the country. Especially helpful during the fiscal year 1918 was the assistance rendered by the fishery officials of the States of Vermont, New York, Michigan, Wisconsin, Minnesota, Illinois, Iowa, Louisiana, Utah, Washington, and Oregon. Before supplying to individuals or organizations fishes not indigenous to given States, the Bureau takes the precaution of referring the applications to the State officials and securing their approval.

An assignment of sockeye-salmon eggs was made from Alaska to British Columbia, with the intention of having the resulting young planted in the Fraser River. The shipment arrived in bad condition, and only comparatively few young were produced. Limited consignments of chinook-salmon and rainbow-trout eggs were made to Japan, and small numbers of black bass and yellow perch were sent to Mexico. At the request of the authorities of the Canal Zone, 7,875 fingerling black bass, carp, catfish, and sunfish were planted in Gatun Lake. The details of the foreign shipments are as follows:

SHIPMENTS OF FISH AND FISH EGGS TO CANAL ZONE AND FOREIGN COUNTRIES DURING THE FISCAL YEAR 1918.

Canada: Sockeye salmon	eggs	10,000,000
Japan:		
Chinook salmon	do	100,000
Rainbow trout	do	100,000
Mexico:		
Largemouth black bass	fingerlings	750
Yellow perch	do	200
Canal Zone:		
Largemouth black bass	do	1,000
Carp	do	1,875
Catfish	do	3,000
Sunfish	do	2,000

The possibilities of increased fish-cultural work on the Great Lakes, particularly on Lakes Erie and Ontario, as a result of more intimate cooperation between the United States and Canada have recently become more evident, and arrangements have been made by which all available sources of egg supply will be exploited. Especially valuable during recent seasons has been the courteous action of the fishery officials of Canada in opening to spawn takers from the Cape Vincent station the whitefish spawning grounds in the Bay of Quinte, Lake Ontario.

RESCUE OF STRANDED FISHES.

The important work of rescuing food fishes from landlocked waters in districts of the Mississippi and Illinois Rivers assumed a wider scope and produced more noteworthy results than in previous years. All of the important old fields were occupied and some new territory was covered, the operations extending from Minnesota to Louisiana, both States inclusive. The principal centers of rescue work were Homer, Minn.; La Crosse, Wis.; Fairport, North McGregor, and Bellevue, Iowa; Meredosia, Ill.; Friar Point, Miss.; and Baton Rouge, La.

With a view to an increased output and a reduced unit cost several valuable new features were introduced in 1918, including the stationing in the immediate vicinity of the rescuing parties of houseboats to be used as living quarters for the fishing crews and improvements to the tank equipment for the holding and hardening of fish intended for transfer to distant points.

The number of food fishes rescued in the fiscal year 1918 was 25,970,041, as against 9,885,005 in 1917. The number of each of the important species was as follows:

Black bass, largemouth	365,424
Black bass, smallmouth	2,433
Buffalofish	2,417,052
Carp	1,660,776
Catfish	12,718,930
Crappie	2,899,462
Drum	83,473
Pike	106,408
Pike perch	1,954
River herring	3,700,000
Rock bass	5,940
Sunfish	1,393,835
Warmouth bass	7,970
White bass	47,261
Yellow perch	458,923
Miscellaneous	100,200
Total	25,970,041

A very large percentage of the fishes rescued are returned to the adjacent open waters of the rivers and are not liable again to be stranded for another year; meanwhile they will have increased in size and economic value. Small numbers of these fishes of all species, but particularly black bass, crappie, sunfish, and catfish, are used by the Bureau in filling applications for stocking ponds, lakes, and streams in the adjoining or remote States. The fish thus delivered

to applicants aggregated 692,732, or less than 3 per cent of the total number handled.

The importance of this work arises from (1) its insignificant cost, (2) the inevitable waste of the fishes unless they are salvaged, and (3) the recognized edible qualities of all the fishes thus saved and the great mass of wholesome food they represent. The results are such as merit adequate financial support, so that the whole vast territory may be adequately covered each year and every available young food fish that would otherwise perish may be saved for ultimate consumption by man.

ACCLIMATIZATION.

In November, 1917, a carload of adult eastern lobsters, numbering 6,000 equally divided as to sex, was sent from Boothbay Harbor, Me., via Bath, to Anacortes, Wash., in charge of Superintendent E. E. Hahn. The lobsters arrived at their destination on November 13, having been in transit since the 7th instant. The loss was only 5 per cent, and the shipment was regarded as the most successful of its kind. After a lot of 60 was reserved for experimental work, the lobsters, all in a very healthy, vigorous condition, were transferred to live cars, towed to the San Juan Islands, and liberated at selected points.

This was the sixth lot of adult lobsters sent by the Bureau to Puget Sound in recent years in the effort to establish this valuable creature on the Pacific Coast. In arranging for the shipment special precautions were taken, not only in the selection of the stock, but in the preparation of packing cases and material. The consignment included only individuals that had been carefully hardened in advance. The experience of the previous year having demonstrated the utility of a special barrel, built with shelves in the center at intervals of 6 inches and provided with ice compartments on either side, 40 such barrels, or a sufficient number to hold one-third of the shipment, were constructed. The remaining lobsters were carried in 130 specially designed crates, two layers to the crate, and in 90 large boxes having one layer each. All straw used for packing was first immersed in strong brine. All the packages carried well, but the lobsters in the shallow boxes with brine-soaked straw were somewhat stronger, and this method has apparently advantages over the others and leaves little to be desired for long-distance shipments.

Arrangements are being made to conduct a thorough search for eastern lobsters in Puget Sound, by setting regular lobster pots in charge of competent fishermen. As showing the apparent adaptability of the lobsters to these waters, it may be noted that those reserved from the November shipment and retained in a live car at Anacortes remained in excellent condition, taking culled canned salmon regularly, and sustaining a loss of only four, until January 17, 1918, when they escaped during an unusually high tide.

Noteworthy results have attended the acclimatization of the humpback or pink salmon on the coast of Maine, and the possible economic outcome appears to justify a continuance of the work.

From a shipment of 1,000,000 humpback eggs from Puget Sound arriving at the Craig Brook station in November, 1917, 934,235 fry

were hatched in January; and during March and April the resulting fingerlings were planted in Dennys and Pembroke Rivers, at points 2 to 4 miles above tidewater.

In August, September, and October, 1917, many thousand humpbacks entered rivers in eastern Maine. A few fish were observed or reported in Penobscot, St. George, Medomac, St. Croix, and other streams, but the principal runs were in Dennys and Pembroke Rivers.

Several representatives of the Bureau visited streams in which the humpbacks were reported and secured first-hand information regarding the runs. Arrangements were made to take eggs for hatching purposes, but the run at any given point was so short after the arrival of the fish-culturist that only a few thousand eggs could be obtained, most of the fish being spent. Net fishing at this season is prohibited by the local law, and a considerable number of the fish were able to spawn naturally, although the conditions for the passage of fish up some of the streams could be greatly improved by the installation of fishways.

At the dam in Penobscot River at Bangor 10 humpbacks were captured between August 13 and 31. In Pembroke River, on September 27, at a time when the salmon were present by hundreds, the State fish warden collected 25 specimens and placed them above the dam at Pembroke. In Dennys River, in the vicinity of Dennysville, during the week of September 29–October 6, at least 1,200 adult humpbacks were seen and many more fish were known to be in the deep pools and on the rips about 6 miles upstream from the head of tidewater. Many fish congregated under some large rafts of logs in that section and could not be driven out, so that their number could not be estimated. On one visit of a fish-culturist from the Craig Brook hatchery about 50 fish were seen on the rips. Altogether, at least 2,000 fish were observed in Dennys River and 500 in Pembroke River.

Some poaching on the part of the people living on the streams occurred, and the pickling of humpbacks on Pembroke River was reported, the fish having been taken with pitchforks. Some people at Dennysville were reported to have been made ill by eating a humpback that had been picked up by a small boy as it drifted downstream in a moribund condition after having spawned. The superintendent of the Craig Brook station went among the river people and advised them that these fish are not suitable for food when in spawning condition and should be eaten only when taken in salt water or immediately after coming in from the sea.

A number of specimens of humpbacks from Dennys River were forwarded to Washington, and one of them, weighing 6½ pounds and 22 inches in length has been on exhibition in the Secretary's office. The average weight of the fish observed by the Bureau's agents was about 5 pounds; the largest, a male, weighed 10 pounds 9 ounces, and the smallest, a female, weighed 2½ pounds. Some examples, together with a collection of scales from others, have been examined by Dr. Charles H. Gilbert, the well-known authority on the Pacific salmons, and it is shown therefrom that the humpback in its new environment retains its Pacific habit of proceeding to the ocean shortly after it begins to swim and returning to the rivers to spawn and die when 2 years old.

ARTIFICIAL PROPAGATION OF FRESH-WATER MUSSELS.

The work of propagating fresh-water pearly mussels at various places in the basin of the Mississippi River was conducted as usual under the direction of the Fairport laboratory. The number of young mussels (glochidia) liberated in a condition of parasitism on fishes was 209,132,800, as compared with 252,478,700 in the fiscal year 1917. The decrease was largely accounted for by the fact that during a considerable portion of the season most favorable for collecting the fish hosts very few of the mussels were gravid. This was especially the case with the mucket, the principal mussel handled. The number of fishes infected prior to release was 252,259, of which 159,190 were seined in open waters, 83,982 were rescued from landlocked pools and lakes, and 9,087 were propagated and reared at the Fairport station.

Three new fields for mussel propagation were opened during the year, namely, New Boston, Ill., on the Mississippi, a point on the Ohio River near Louisville, and Lake Pokegama, Minn. The collecting of juvenile mussels in Lake Pepin indicated that the artificial propagation of the local species of mucket in that water is producing good results. Collecting done in the White River, Ark., yielded numbers of young niggerheads and yellow sandshells but no muckets.

The cost of mussel propagation in 1918 was considerably in excess of that in the previous year. The cost of glochidia planted was $0.0536 per thousand, as compared with $0.373 per thousand in 1917. The increased cost of equipment, material, and labor contributed largely to the increased expense of the propagation work. This computed cost of propagation includes salaries of permanent employees actually engaged, overhead charges, and depreciation of $0.004 per thousand. The overhead charges include one-third the director's salary; one-half the superintendent's salary, and one-half the clerk's salary.

The experimental propagation of mussels at the Fairport station was continued. Especially gratifying results were obtained in one pond, from which a total of 1,391 young of the Lake Pepin mucket were obtained when drained October 8 to 16, 1917. These mussels were the result of plants in the preceding season from fish held in open-bottom crates over an especially prepared bottom of sand. They varied considerably in size, measuring from about 1 inch to 2½ inches in length, indicating that they resulted from several plants. These results are especially important, as this is by far the largest number of mussels ever reared under artificial conditions at one time. Fish infected with this mucket had also been placed in crates in two other ponds in the spring of 1917, and when these were drained in the fall 382 mussels were recovered. Specimens resulting from a plant made in 1914 continued to grow in the station ponds, and by October, 1917, some had reached a length of more than 3½ inches.

MUSSEL PROPAGATION, FISCAL YEAR ENDED JUNE 30, 1918—POINTS OF DEPOSIT AND SPECIES OF GLOCHIDIA PLANTED.

Species.	Fairport, Pokegama	Fairport, Mississippi River.	New Boston, Mississippi River.	Lake Pepin.	Black River.
Yellow sandshell (*Lampsilis anodontoides*)	.....	3,547,900	4,548,000	.....	.....
Mucket (*Lampsilis ligamentina*)	.....	11,758,850	26,687,400	.....	19,296,500
Butterfly (*Plagiola securis*)	.....	38,800	.....	.....	.....
Lake Pepin mucket (*Lampsilis luteola*)	30,417,700	65,000	.....	91,226,800	.....
Total	30,417,700	15,410,550	31,235,400	91,226,800	19,296,500

Species.	White River.	Cumberland River.	Lake Keokuk.	Ohio River	Total.
Yellow sandshell (*Lampsilis anodontoides*)	11,000	15,500	149,200	.....	8,271,600
Mucket (*Lampsilis ligamentina*)	1,797,000	2,338,500	248,000	5,925,100	68,051,350
Butterfly (*Plagiola securis*)	518,000	.....	34,000	.....	590,800
Lake Pepin mucket (*Lampsilis luteola*)	.....	.....	9,707,100	.....	131,416,600
Black sandshell (*Lampsilis recta*)	115,325	.....	22,500	.....	137,825
Pocketbook (*Lampsilis ventricosa*)	664,650	.....	.....	.....	664,650
Total	3,105,975	2,354,000	10,160,800	5,925,100	209,132,825

INVESTIGATIONS AND EXPERIMENTS REGARDING AQUATIC PRODUCTS.

MODIFICATION OF THE SCIENTIFIC WORK.

The conditions of war have necessarily led to marked modifications of the Bureau's general plan of scientific work. Efforts have been devoted primarily to such studies or practical experiments as could be expected to contribute promptly to the increase of the supply of food or other useful aquatic products, but there has been no exclusion of biological and chemical investigations which have to do chiefly with our preparation for meeting the problems that will confront the Nation after the war. An outline of the scope of the chief investigations and other work appropriately associated with the scientific inquiries, and in some cases the actual results obtained, are briefly summarized.

EXPERIMENTS RELATING TO THE PRESERVATION OF FISHERY PRODUCTS.

An important phase of the Bureau's scientific work is the solving of problems in the preservation of fishes for food. No more useful service for the prevention of waste and the promotion of the use of aquatic foods can be rendered than by ascertaining the conditions leading to spoilage of fresh and cured fish and by discovering more effective methods of preservation. Especially is it important to find means of treatment or of preservation which are suited to the fishes that can not be adequately utilized by old methods or are adapted to climatic or transportation conditions under which the common means of preservation fail of their purpose.

Principal among investigations of this character are the experiments in the preservation of fresh fishes by methods of desiccation.

Similar modes of preservation have established their efficiency for the preservation of vegetables both in the home and in the industries. Dried salt fish are well known in the market, but under the climatic conditions prevailing in the United States the sun-drying of fresh fish has not proved commercially feasible.

Drying of fresh fish.—Working in the Woods Hole laboratory during the summer of 1917 an investigator conducted experiments in drying various species of fresh fish and squid. Domestic fruit driers, steam-heated fish driers, driers with air heated by means other than steam, driers which force air over the fish at varying temperature, and the methods and limitations of sun-drying were tried.

Several species of fish, including cod, haddock, and whiting, have been successfully prepared for commerce by preliminary steaming, picking the meat from the bones and skin, passing through a meat chopper, and drying in commercial fish driers. Further experiments may lead to improvements of methods from the viewpoints of economy in production and appearance of the product. Experiments in rehydration of the dried product have also been conducted.

Methods of desiccation have obvious advantages over other methods of preservation in the saving of storage space, in economy of transportation, and in the indefinite preservation of the product without continuous expense. It is also true in some cases, at least, that there is much less waste of soluble nutritive substances, and that the natural flavors may be better maintained.

The results in the case of squid are noteworthy. Squid, in the drying process, is reduced to broad, thin sheets of inviting appearance which may be chopped to form chowder or soup stock. There is a characteristic and particularly agreeable flavor which, together with the very high protein content, promises much for the eventual addition of the squid to the American dietary. Subsequent experiments have shown that the tenderness of the product is much improved by steam cooking before the squid is dried. While squid can be conveniently canned, the process of canning fails to preserve the characteristic flavor so well as the method of desiccation. The palatability of the squid has been so thoroughly tested by people of many Asiatic and European countries that one must consider the lack of acquaintance with it as the only bar to its use by Americans. Important facts of practical value that have now been definitely determined are: (1) The toughness of the meat is overcome by methods of steam cooking and drying, after which the squid can be kept for an indefinite period without deterioration; (2) the excellent flavor and delicate aroma are not lost by the methods of drying or by subsequent cooking by proper methods, such as by boiling over a hot fire or by stewing for a short time in a small amount of hot water and serving in the juice in which it was cooked.

Bacteriology of preserved fish.—In the field of bacteriology, investigations have been directed first at determining if bacteria play an important part in the initial stages of decompositon of fish during storage in ice. Freshly caught fish of several types were stored in ice boxes similar to those in use in the average fish market, and at regular intervals some were removed and the muscle tissue was subjected to bacteriological examinations to determine the number of aerobic bacteria present that would develop at 22° and 37° C. in both

plain and fish agar. The following conclusions were drawn from the experiments: (1) Fresh muscle tissue is practically sterile; (2) drawn fish show more bacteria than undrawn fish as the period of storage in ice progresses and in a shorter time; (3) undrawn fish stored for a period of two or three weeks in ice and totally unfit for food showed relatively few bacteria; (4) autolysis seems to play a more important part than bacteria in the initial stages of the decomposition of fish stored in ice.

Further studies relate to organisms which cause the "reddening" of salt fish, especially of the cod, a condition which detracts from the appearance of the fish, diminishes the market value of the product, and causes serious economic waste. After a period of preliminary studies in the laboratory during the early part of the year, it was determined to transfer the work to the seat of industrial operations at a principal fishing port. The conditions determining the prevalence of this infection, for such it is, are now pretty well understood, and it is believed that the solution of the problem of preventing the infection is about to be realized.

Miscellaneous investigations of problems of preservation.—Other scientific investigations of immediately practical application have related to the salting and smoking of shark meat, the utilization of grayfish eggs through the preparation of a soluble acid albumen, the extraction of the oil from grayfish eggs, the preparation of gelatin from the heads, fins, and tails of the grayfish, and the relation of ammonia production in the grayfish to the corroding of tin. The alleged toxic qualities of the roe of the garfish have been studied both from chemical and physiological points of view, and some experiments have been made to determine the origin of a certain objectionable flavor which is said to characterize caviar prepared from the roe of the carp. None of these investigations has as yet reached a point justifying the publication of results.

The more directly scientific investigations have been supplemented by practical trials of the preservation of fish in various ways, and in some cases important results have been obtained in the application of old methods to new fishes. The demonstrations associated with such trials have been productive of much good, not only through instruction of fishermen in the use of approved methods of preservation which were previously unknown or unused in certain localities, but, as well, through the education of fishermen with reference to the value of extreme care in the adaptation of commercial methods to the particular species of fish, to the local or seasonal conditions, and to the demands of the market which it is intended to supply.

The scientific assistants in the regular employ of the Bureau and the specialists from without who have associated themselves temporarily with the Government fisheries service have taken an active and effective part in the work of propaganda or public education in the more general and more intelligent use of fish as food. In such work these men of science render a particularly valuable service, because they can speak or write without bias and with a knowledge of the nutritive value of fish food and its appropriate place in the diet. The Bureau has had ample evidence that the public generally has appreciated such service and that it has responded in a practical way to the counsel which has been offered.

Although culinary demonstrations are not strictly a part of the scientific inquiries, nevertheless it has been found impossible to dissociate them from the work of investigation. In some cases skilled cooks have been engaged in association with the investigators or independently, and demonstrations have been given at State or county fairs, before women's organizations, or men's clubs, or in open meetings, whenever the public could be most effectively reached. In this way it has been possible to bridge completely and promptly the common gap between the discovery of useful facts and the final practical application in the individual household of the knowledge gained. In such public services the Bureau has been enabled to cooperate with various bureaus of the Department of Agriculture, notably with the States Relations Service and with the United States Food Administration.

The lack of vessels for offshore investigations has made it impossible to make explorations of oceanic fishing grounds. Reference may be made, however, to an investigation of an alleged waste of fishes on the coast of Cape Cod. It was learned that certain kinds of fishes, especially the whiting, were being taken in the trap nets in quantities far in excess of the capacities of the cold-storage plants, as well as of the market demand for fresh fish of these kinds. The Bureau, therefore, took steps with some success to encourage the preservation of such fishes and to stimulate a public demand for the prepared product.

INVESTIGATIONS RELATING TO SOURCES OF SUPPLY.

The carp has long been the most important commercial fish living exclusively in fresh waters. There has been a good demand for carp in the principal cities, and, because of the increased demand for fish which has developed during the recent food shortage, the prices of carp have risen to relatively high figures. Nearly all of the carp for market have been shipped from a few States in the Middle West. Nevertheless, carp is known to occur in abundance over a large part of the country. In many waters carp has only a relative abundance and could not be counted on as a source of supply for commercial fishery. Nevertheless, these small supplies in the aggregate constitute a considerable quantity of food, and, if they were more generally used in local markets, a substantial reduction would result in the quantity of other foods it would be necessary to import into the several communities.

It is commonly recognized that when prepared in an offhand manner the carp makes a table dish of inferior quality. It is not so generally known that when properly prepared and served the carp takes a very favorable rank among other food fishes. In the effort to popularize this fish, the Bureau has prepared and published an economic circular giving an account of the food value of the carp, with recipes for its proper preparation. Effective posters were also given wide distribution directing attention to this neglected resource and bearing information that the circulars could be had on application to the Bureau.

Believing that there were supplies of carp in some of the southern States sufficient to support a commercial fishery, the Bureau under-

took a special investigation of the subject in the waters of South Carolina as typical of the conditions in several southern States. The survey covered a period of several months and involved many experiments or fishing trials intended to determine the proper sorts of gear to use under the varying local conditions. The results of the survey may be summarized as follows:

The "upstate" waters will support only limited commercial fisheries and the output of these may be consumed locally; much local interest was found among farmers and others who possessed some sort of equipment for catching fish which they were unable to use because of the severe legal restrictions upon the fishery. The larger rivers, especially in their lower courses, offer favorable opportunities for the development of larger commercial fisheries. It is probable that fishing for carp in rivers near the coast for shipment to northern markets will prove distinctly profitable, especially if, as expected, the carp can be taken successfully during the winter months, when the conditions for transportation are at the best and the market prices are most attractive. Local fishermen witnessed and participated in the fishing trials.

An incidental result of the experiments and the inquiries associated therewith was the preparation of a paper treating of the methods of capturing carp commercially under different conditions. The information thus furnished will be applicable in all parts of the country where unutilized carp resources exist.

Other investigations have been directed toward locating beds of sea mussels on the North Atlantic coast which will support a commercial fishery of importance, and toward completing surveys of the sea-mussel resources of the coast of California and the shellfish resources of the northwest coast.

EXPERIMENTAL FISH CULTURE.

The investigations and experiments conducted at the fisheries biological station at Fairport, Iowa, and directed toward the establishment of a more scientific foundation for fish culture in ponds, have continued to yield interesting and useful results. Both the buffalofish and the channel catfish have again responded satisfactorily to the attempts at propagation in ponds.

A comprehensive study has been made of the abundance, life history, habits, and importance of many species of dragon-flies and damsel-flies in fish ponds. In their relation to fish it is learned that while the larvæ feed to some extent upon the same kinds of food as some fishes, they also subsist to a considerable degree upon animals that are directly harmful to fish; and while, under stress of hunger, they occasionally eat small fishes, they themselves afford an abundant food supply for fish. Although the nonaquatic adults sometimes prey upon beneficial insects, the larger part of their subsistence comprises positively injurious insects. The dragon-flies and damsel-flies have a distinct economic importance in their effect upon the balance of life both within and without the ponds.

Studies of aquatic plants in relation to fish culture are making satisfactory progress and are contributing to the desired fund of knowledge regarding the utility of both the higher and the lower

forms of plant life. Such investigations are of fundamental importance because all food of fish is provided through the medium of plants. There can be no fish or animal life except as the inorganic materials are converted by green plants into materials that are suitable for the food of animals. Fish are thus dependent upon plant life whether they forage directly upon the plants or subsist upon smaller animals that derive their food directly or indirectly from the vegetation. But some plants are more useful than others, and some are undoubtedly injurious in their effects upon ponds. It is necessary, therefore, that previous knowledge be obtained regarding the biological and economic relations of the various forms of plant life within the fish pond.

A significant anatomical study of the salmon, conducted principally in the Washington laboratory, has brought to light previously unrecognized facts regarding the structure of the reproductive organs and the normal manner of extrusion of the eggs. These facts are found to have a direct bearing upon fish-cultural practices, and they dictate the necessity for certain changes in method and for extreme care in the handling and stripping of spawning trout and eastern salmon in order that the loss of eggs and permanent injury to the breeding fish may be avoided.

Reference may be made to an investigation of the possibility of utilizing the abandoned rice fields of South Carolina and Georgia for the culture of carp on a commercial scale.

INVESTIGATIONS AND PRACTICAL WORK IN ANTIMALARIAL CAMPAIGNS.

With the measures which are generally relied upon for the control of the abundance of mosquitoes and the eradication of malaria, this Bureau has no direct concern. They lie within the domain of sanitation and entomology. It may be said, however, that it has become very clear to all concerned that under many conditions the direct methods of sanitary science generally employed in combating the mosquito, whether physical, chemical, or engineering, either are not practicable of application, or else, when applied, fail of accomplishing the desired purpose. It has been found necessary in many cases to rely to a great extent upon nature's method of controlling the abundance of organisms through their competitors and enemies. It is well known, however, that nature's control of the abundance of mosquitoes, as of other animals and plants generally, is relative and not absolute. The problem in this case is to find means of making the enemies of mosquito larvæ dominant over their natural prey, of making them efficient in the extermination of the larvæ of anophelid mosquitoes at least.

The problem is primarily within the domain of aquatic biology and concerns especially the small mosquito-eating fishes and other associates; and in this problem, in its phases both of investigation and of practical work, the assistance of the Bureau of Fisheries has been solicited by the Bureau of Entomology and the Public Health Service.

The cooperation with the Public Health Service has been principally in the urgent task of protecting the health of soldiers in one of the large southern cantonments. The plan of work comprised

the use of all available means of protecting and increasing the supply of top minnows (Gambusia) in the area under protection, and the careful observation of the effectiveness of these and other fishes in the extermination of mosquito larvæ. To increase the number of minnows in the extra-cantonment area, propagation was resorted to and fish were also brought in from places outside of the protected area. As the top minnows were found to be a favorite live bait in angling, the cooperation of the public was sought and received through the use of posters, placed at or near the various small ponds, bearing a warning that the small fish were given protection as a health measure.

It has been fully demonstrated that the small fishes are in many cases most effective agents for the control of mosquitoes, but it has also been positively ascertained that the efficiency of fish even when present in abundance is by no means universal and complete. Much depends upon the physical and biological conditions in the water, such as the presence of débris and of plants of various species, wave action, fluctuations of level, and various other factors. There is, as yet, lacking the degree of knowledge necessary to define fully the conditions under which fish are effective, or to govern the change of conditions so as to make the fish as efficient as is desired. It is with reference to securing a sure foundation of knowledge concerning the relations of fish and mosquito larvæ that the campaign of observation and experiment in cooperation with the Bureau of Entomology was undertaken two years ago at Mound, La., as mentioned in previous reports. The investigations at Mound have been continued actively and bid fair to make substantial contributions to knowledge which will be of direct and decisive importance in the future conduct of antimalarial compaigns.

DISEASES AND PARASITES OF FISHES.

The Bureau has given special attention to the diseases of fishes as bearing upon the loss of fish in hatcheries, fish ponds, and public waters. While the subject is broad and the problems arising are difficult and tedious of solution, substantial progress has, nevertheless, been made during the year in the study of some of the affections to which fish are subjected in artificial and natural bodies of water.

A new parasite of the buffalofish.—An investigator of the Fisheries Biological Station at Fairport, Iowa, has discovered a new and evidently important form of trematode worm which infests buffalofish in ponds. The life history of the parasite has been definitely worked out and is briefly as follows:

The adult trematode, living in the alimentary tract of the buffalofish, expels its eggs, which pass out into the water. From each of these eggs, which are "laid" during the late summer, there hatches in the fall a ciliated embryo (mericidium), which swims in the water until it finds a snail of the species *Planorbis trivolvis*. Into this snail it works its way and eventually encysts in its host's liver. In the usual manner it grows and multiplies there during the winter and spring, and in summer emerges from the snail as a tailed and styleted cercaria. This larva can live for several hours in the water, but must find a May fly larva for its second intermediate host, into which

it bores and encysts just beneath the cuticle. If the buffalofish eats the infected larva it obtains the young parasite, which very rapidly develops and assumes in the late summer the adult form ready to expel its eggs. The association of the buffalofish, the snail, and the May fly larva seems to be essential for the perpetuation of the parasite. The probable importance of the form is suggested by the fact that a serious mortality occurred among the fishes that were so infested.

The life history of a trematode parasite of the bluegill sunfish was also investigated. It is found in the larval stage in that fish and in the adult stage in the kingfisher.

Investigation of protozoan parasites.—Investigations of protozoan parasites at the Bureau's station at Fairport, Iowa, during the summers of 1916 and 1917 produced interesting results which promise to be of practical value to fish culture. The myxosporidia are quite common on fish from the Mississippi River, and evidence seems to prove that they are to a degree seasonal in occurrence. Under certain conditions they may cause serious injury to the host, but in the case of the buffalofish, and possibly of other species, it is believed that danger from infection in ponds might be lessened by a proper rotation of the fish in a series of ponds, as the young seem to become infected from the adults placed in the same pond to spawn.

A hitherto undescribed species of coccidia is believed to have caused the death of young carp after transference from one of the ponds to hatchery troughs, as an exceptionally heavy infection of the intestines with these parasites was associated with a serious degree of mortality. Although infection of the pond fish with the ciliate parasites Ichthyophthirius, Chilodon, and Cyclochæta was quite common, a much heavier infection after transference of the fish from the ponds to the tank house, probably induced by change of environment, would seem to indicate that these parasites have been largely responsible for the previous heavy mortality of the fish in the tanks.

Peculiar disease in brook trout.—At a commercial hatchery in Rhode Island a peculiar disease of brook trout caused the loss of a large number of fish. The diseased fish at first became apathetic, then turned black and became blind. Just before death the fish would dart jerkily through the water for a time, losing equilibrium toward the last. As the result of the experiments conducted under the guidance of the fish pathologist of the Bureau, the cause of this unusual affection of trout was traced to the nonoil substances in linseed meal, the latter being a constituent of the food then used at this hatchery. The harmful effects of the linseed meal are believed to be due to action of a cyanogenetic glucoside or its decomposition products, though the actual proof will require further experimentation.

Miscellaneous studies of disease and parasites.—During the year a serious condition of diminished vitality and disease of the blue pike was reported from several points on Lake Erie. Specimens of fish received from Cleveland, Ohio, were found to be unusually heavily infected with a species of parasitic copepod (identified as *Ergasilus centrarchidarum*), which is known to occur abundantly on perch, sunfish, and bass, but is not generally found in numbers on blue pike and saugers. The fact of the peculiar abundance of parasites

on this particular species was held to indicate that some other condition had diminished the powers of resistance of the fish and made them an easier prey to parasites. There was some evidence of malnutrition and internal disorders, but investigation in the limited time available failed to reveal the original cause of the trouble.

A systematic examination of the parasites of fishes in Oneida Lake, N. Y., was made in cooperation with the biological department of the New York School of Forestry, but the study of the material obtained has not yet been completed. Further comprehensive study of the internal parasites of marine fishes was made in connection with the Woods Hole, Mass., laboratory.

Visits by the fish pathologist of the Bureau were made to various Government and commercial hatcheries for the purpose of inquiring into the cause of mortality and of offering suggestions for the prevention of loss by disease.

MISCELLANEOUS INVESTIGATIONS.

While the scientific work has been restricted generally to matters relating to the winning of the war, the Bureau has, nevertheless, continued several investigations which are of great ultimate importance and could not be interrupted without unwarranted sacrifice. Some of these investigations that have not reached a stage for report may be mentioned as follows: The intimate study of the habits and propagation of salmon of Pacific waters; problems of the oyster industry; the properties of the roe of certain fishes alleged to be toxic or distasteful; systematic relations, habits, and migrations of salmonoid fishes in the Great Lakes; the utilization of marine algæ; biological and physical conditions of fish life in inclosed waters; the distribution and habits of pelagic fishes off southern California. Among others the following may be cited:

Nature of "fat" oysters.—Technical studies have shown conclusively that so-called "fat" oysters are rich, not in fats, but in glycogen, a carbohydrate food. The processes of "fattening" must, then, be based upon conditions favoring glycogen formation. The place of oysters in the dietary is not just the same as that of meats and fish, which are eaten for their protein and fat content. Oysters furnish protein, but little fat, and, if they are in prime condition, they also furnish a significant amount of carbohydrate material, such as is usually made up by the cereal and vegetable elements of the dietary.

Protection of wood against marine borers.—The experiments and studies on this subject, which have been conducted in cooperation with the Forest Products Laboratory at Madison, Wis., and the Bureau of Forestry, have been practically completed as regards the use of creosote oils. Some of the results have been published independently by the investigators. Since the conclusions will be useful to all those who are directly concerned with the use of wood in the waters of warmer latitudes, they may be summarized in the words of the investigators, as follows:

1. The toxicity of creosote fractions decreases as the boiling point rises; that is, the creosote and its distillates, arranged in the order of decreasing toxicities, are: Fraction I, fraction II, creosote, fraction III, fraction IV, fraction V. The high toxicity of fraction II,

which is solid with naphthalene, was probably due mainly to tar acids.

2. The creosote light oils are definitely poisonous for the borers. Benzol is the most and xylol is the least toxic. The toxicity of toluol lies between these two.

3. The tar acids are all highly poisonous to the borers. Their toxicity steadily increases with rise in molecular weight; that is, arranged in order of increasing toxicity, they are: Phenol, the cresols, and the naphthols. The three isomeric cresols, which exert practically the same degree of toxic action, are about twice as poisonous as carbolic acid; while the two naphthols, also equally toxic, are 10 or more times as poisonous as phenol.

4. Tar-base fractions all show a high toxicity for the borers, and this toxicity increases with rise of boiling point of the fractions. Pure quinoline, boiling at 239° C., is several times as poisonous as pyridine, with a boiling point of 115° C. The toxicities of the tar bases are fairly comparable with those of tar acids of approximately the same boiling points.

5. In comparison with the tar acids or bases or even the lighter hydrocarbon oils, the solid hydrocarbons of creosote are only very slightly toxic. Arranged in the order of decreasing effectiveness, they are naphthalene, phenanthrene, acenaphthene, and anthracene. Naphthalene is perhaps five times as toxic as anthracene.

It has apparently been assumed that the more poisonous a creosote oil is the more effectively will it prevent attacks of marine borers. It will be noted, however, that the conclusions drawn from these direct toxicity tests, especially with reference to creosote and its fractionates, are diametrically opposed to the conclusions drawn from the service tests above; that is, the highest boiling fraction, which was the least poisonous, stood up the best in actual service. It has been pointed out that the principal object is to prevent an original attack of the larval shipworm when it is of but microscopic size. Heavy treatments with a proper type of creosote will still prove inadequate as long as areas of superficially treated sapwood, heartwood, knots, etc., are left exposed for the lodgment of shipworm larvæ.

The investigators conclude that a proper creosote oil for marine work should contain a large proportion of constituents boiling above 320° C., as well as considerable amounts of high-boiling tar acids and bases.

Marine algæ of the Pacific Coast.—Through the cooperation of a specialist from the University of California, marine algæ have been collected on the Pacific Coast from Grays Harbor, Wash., to Sitka, Alaska. Many new forms were discovered and the range of species previously known was extended. Of about 875 species previously reported on the Pacific Coast of North America from Mexico to Bering Sea about half are now represented in a collection prepared for the Bureau which will be deposited in the National Museum.

Interest in the marine algæ arises from the intimate relations existing between them and the fishes and shellfishes; from the significance of marine plants as ultimate sources of organic material in the sea, and thus as an indirect source of food for fishes; and from the fact that the algæ are resources useful in some cases for human food and in others as the basic material for potash, iodine, gelatin,

and other products useful in the arts and industries. The marine algæ, although the use of certain groups has recently been greatly increased, may in general be regarded as neglected resources in the United States.

WORK AT THE FISHERIES LABORATORIES.

The use of the marine laboratories at Beaufort, N. C., and Woods Hole, Mass., for naval purposes has necessarily restricted the work of the Bureau thereat. During the early part of the fiscal year, before the Beaufort station had been turned over to the Navy, the laboratory served as a base for practical experiments in the preservation of fish by methods of salting and smoking, and for propaganda both among fishermen of the near-by coast and among consumers in the interior of the State, directed at better utilization of the local fish supply for food.

At this station also there was completed early in the year the field work of the investigation pertaining to the use of creosote oils for the protection of wood against marine borers, the results of which are referred to elsewhere. The Bureau has now entirely discontinued its operations at this place, with the exception of experiments in perfecting the culture of the diamond-back terrapin.

The Woods Hole, Mass., laboratory was employed during the early part of the fiscal year for experiments and investigations relating to the preparation of fish and bacteriological studies of fish tissues. Further attention was given also to the nutrition of oysters, the parasites of fishes, and the food of young fishes in local waters.

At the marine station at Key West, Fla., two buildings of small size have been constructed, one affording necessary living accommodations for some of the employees, and another space for the pumping equipment and for a provisional laboratory. These, with the canal and pool for water supply largely completed during this and the preceding year, are regarded as among the most essential requirements for the effective prosecution of work. The difficulties of obtaining labor and materials and the very high prices prevailing have made it unavoidable that progress in construction should be slow. Under the present conditions and with the limited funds available, further constructions are not contemplated. In spite of the inadequate equipment, an effective beginning of the scientific work of this station has been made. Useful information has been gathered regarding the fishes of the region, and the studies and experiments with the spiny lobster have yielded information that is interesting and promising of practical usefulness.

At the Fairport, Iowa, laboratory the investigation of mussel problems and the various studies relating to fish-cultural work, elsewhere referred to, were continued with satisfactory progress. The results of mussel propagation are given in another place. The Bureau suffered a severe loss at this station through the accidental destruction by fire of the main laboratory building in the early morning of December 20, 1917. Besides the building there were lost a library which, though small, had been assembled with much care, and valuable scientific records and natural history specimens. Fortunately the water-supply system and the smaller buildings remained unharmed, so that many phases of the important work of the station

could be continued without interruption. Congress has provided an appropriation for the erection of a fireproof building to replace the original building, which was of frame construction. At the close of the fiscal year plans for the new laboratory were nearing completion.

RELATIONS WITH THE FISHING INDUSTRIES.

INCREASING THE CONSUMPTION OF AQUATIC FOODS.

It is possible to record more active and effective work than in any previous year in making the American people better acquainted with the merits and availability of our aquatic resources as food and in pointing out sources of supply. This work has assumed a wide scope and many phases, but the primal effort and purpose have been to increase public reliance on such resources as staple articles of food, to dissipate unwarranted prejudices, and to cause the discontinuance of wasteful practices in the utilization of water products.

The Bureau is fully cognizant of the important service it can and should render the fishing industries, by determining and making known the suitability of many of our fishes to new and untried methods of preservation; by sending trained experts to the fishing centers to give instruction in those methods which prove meritorious; by improving methods in common practice and discouraging the use of unsatisfactory methods; by introducing into our fisheries useful foreign methods and processes; by increasing the use of the little-used or neglected fishes and fishery products; by developing methods of preparation and new uses for the waste products of the fisheries; by furnishing to fishermen and others practical advice relative to special equipment required for new methods and processes that may be in contemplation; and by contributing by all available means to the upbuilding of the fisheries, while at the same time safeguarding these resources from possible depletion or exhaustion.

During the past year the demands on the fishing resources of the country have been of such magnitude that the Bureau has found an unprecedented opportunity for rendering service in the field of endeavor before outlined. It has devoted all possible energies to the solution of those problems which promised the largest and most immediate results, and has diverted men and funds to work of this character in so far as it was possible so to do. The small available force of trained assistants has been the principal factor in limiting the activities. The meager funds allowed by Congress for this work have been supplemented by the special allotment elsewhere referred to.

Aid has been rendered in developing markets for such inadequately used or partly neglected fishes as the herring of Alaska, bowfin, burbot, carp, crevalles, drum, elops, eulachon, grayfish, gizzard shad, jewfish, menhaden, rays, redfish, river herrings, robalo, rockfishes, sablefish, sea catfishes, sea robins, sharks, skates, tarpon, and tilefish; such aquatic mammals as dolphins, porpoises, and whales; and such neglected food products as fish roe and milt. For some species the Bureau has developed new and suitable methods of preservation, discouraged the practice of unprofitable methods, and assisted in solving difficulties which were obstructive to the full use of the product.

One of the agents has devoted his entire time to a study of practical problems of the west-coast fisheries. This work has been pro-

ductive of much good, and has enabled the Bureau to render more effective service in this field. Another of its agents has been conducting a campaign of education in the Middle West as to the merits of the South Atlantic and Gulf coast fishes which can be supplied in large quantities. In cooperation with other Government agencies, the Bureau has been instrumental in bringing Gulf coast fishes into Tennessee, Kentucky, and Indiana in carload lots at a time when it was difficult to obtain in that region satisfactory supplies of fresh fish at reasonable cost. Within two months of the inauguration of this service, about 200,000 pounds of fish were shipped and plans are being perfected for the extension of this kind of service to other sections.

In order to bring newly introduced fishes or other products to the attention of the consuming public, it is necessary to conduct a systematic and well-sustained advertising campaign. By the issuance and wide distribution of posters and placards devoted to particular fishes, by having the newer products tested by workers skilled in cookery to determine the best methods of preparation for the table, and by the printing, in inexpensive form, of cook books embodying the results of tests, the Bureau has been able to interest a large number of people in the merits of water products with which they were not previously acquainted. A still more direct appeal to the public has been the employment of well-qualified demonstrators for the purpose of educating housewives in fish cookery, teaching them to recognize the qualities of each kind of fish and prepare it in the manner best suited to its character, and showing how to utilize heads, bones, and other waste parts for savory sauces, soups, and chowders. On the Pacific coast the demonstrations have been exceedingly popular and well patronized, and local fish dealers report much larger sales of cheaper fish in consequence of this work. Plans are being perfected for the extension of this service to other parts of the country.

It has, as yet, been possible to form no reliable estimate of the actual results of the campaigns for the introduction of bowfin, drum, eulachon, menhaden, sharks, roe and buckroe, mussels, etc.; but, on the basis of fresh weight, it is known that upward of 32,500,000 pounds of burbot, grayfish, sablefish, tilefish, whiting, and Scotch-cured Alaska herring were marketed in 1917, and most of this quantity can be attributed to the recent activities of the Bureau.

Among the products in whose behalf there were special activities the following may be mentioned:

Fish roe and buckroe.—The eggs of such fishes as the sturgeon and spoonbill catfish, or paddlefish, are made into caviar, which is classed among the most valuable of our fishery products. The roes of various others, such as cod, haddock, mullet, river herring, shad, and whitefish, are quite extensively used for food, either fresh, salted, or canned. On the other hand, large quantities of roe, and practically all of the buckroe or milt of marketed fishes, are wasted. These are essentially nitrogenous foods, with a considerable quantity of fat, and differ in composition but little from the flesh of the fish. They do, however, contain a larger quantity of an important constituent of food, organic phosphorous, in the form of lecithin. The buckroe, or milt roe, of the male, which corresponds to the egg mass of the female

and is sometimes called soft roe, as shown by analysis, compares favorably in food value with the roe and flesh of the fish. This is an excellent product, a delicate and palatable food, which lends itself to preparation in all the ways in which sweetbreads and brains are served. These products may be used fresh or canned.

The Bureau has encouraged fishermen to pack these products, has aided in the marketing of such stocks as have been accumulated, and is educating the public to their merits. In addition to the usual packs of roe of various fishes, small quantities of the buckroe of the river herring, sea herring, and cod have been put up and preparations have been made for the pack of the buckroe of other species in season. Now that the packers are beginning to appreciate the quality of the product and the fact that it can be marketed, it is believed that much larger packs will be put up in the future.

River herring or alewives.—The fishery for these species is of great importance in the Chesapeake Bay region and the sounds of North Carolina. The Bureau has given considerable attention to the development of much-needed improvements in the methods of handling and preservation of the catch, and has emphasized the importance of the packers adopting these measures. Experiments in Scotch curing indicated that these fish, preserved in this manner, will not yield a high-grade product. They may be preserved as Russian sardines, but are slightly inferior to the sea herring because of their larger size and lower fat content. Some of the fish were experimentally canned in tomato sauce, mustard sauce, and vinegar. The addition of the tomato sauce greatly improves the quality of the fish, and, if the packers will overcome the present difficulty of shrinkage in the can and process the fish carefully with the addition of the sauce, it is the consensus of opinion that a product of high quality, acceptable to the trade, can be produced. Fish soused in brine made of vinegar, salt, and sugar, in the proportion of about 18 pounds of salt, 6 pounds of sugar, and 8 quarts of pure grain spirit vinegar to 24 quarts of water, then smoked lightly and canned were very palatable. Because of the added expense and labor, it may not be practicable to pack the fish by this method for market. It is unfortunate that not all of the packers appreciate the importance of packing only sound fish, under sanitary conditions, which must be done if the fishery is to continue to thrive.

Menhaden.—The menhaden is one of the most abundant species in our Atlantic coastal waters. It has been used almost solely for conversion into fish oil and fertilizer, and the catch for this purpose has in a single year amounted to over 1,000,000,000 fish, weighing more than 635,000,000 pounds. The possibilities of this fish as a material factor in our food supply are obvious. Small quantities of fresh menhaden are eaten by the fishermen and small numbers are sometimes included with shipments of miscellaneous fresh fish to our larger cities. The number marketed in this manner is increasing. In New York City during September, 1917, 29,638 pounds of the fresh fish were marketed, and in October, 33,379 pounds. Considerable quantities were marketed in Washington City in the autumn of 1917, as many as 50 barrels (about 10,000 pounds) having been sold at the wharves in one day. During the fall fishing for menhaden in the Chesapeake Bay region, each fisherman on the menhaden boats

is privileged to salt for winter use a barrel of select menhaden and many of the fishermen avail themselves of this privilege. Experiments conducted by the Bureau indicate that this fish can be rendered very palatable by salting and smoking, and also that it makes an acceptable canned food.

Sharks.—The value of sharks as food has been recognized in the countries bordering on the Mediterranean, in Great Britain, in Japan, and in many other countries. Until recently their use for food in the United States has been limited mainly to seafaring people in scattered localities, and to the markets of some of our larger cities, where they are not infrequently sold under the name of more highly valued fishes. The number of markets offering these fishes for sale is increasing, and more and more of the product is being sold for what it is.

The flesh is white, slightly gelatinous, and compares favorably in food value with other staple food fishes and meats. The flesh of the young and of the smaller varieties, such as the grayfish, common to our coastal waters, is very good fresh. The flesh of the larger sharks may be salted, smoked or kippered, salted and dried, flaked or shredded. Experiments conducted by the Bureau indicate that the product lends itself particularly to light salting and hot smoking, and the kippered product may be canned to advantage.

Results of private investigations reveal the presence of a large percentage of hydrocarbon oil in the liver oil of some sharks. This property or the presence of some alkaloid may account for the reputed unsuitability for food of the livers and of the flesh of some of the species occurring in Arctic waters. However, the flesh of practically all of the species taken on our coasts has been tried and pronounced suitable for human consumption; in fact, that of a number of species is spoken of highly as the equal of some of our choicest fishes.

Carp.—The carp is the most abundant, most widely distributed, and most valuable fish in the fresh waters of the United States. During a considerable part of the past year difficulty has been experienced in supplying the demand for this fish. With the increase in demand for it in those sections where its merits as a food fish are appreciated and with the inability of the regular fisheries to supply the demand, the need of developing additional fisheries has been felt. The Bureau has extended aid to various sections in widening the markets and studying the possibilities for establishing fisheries, and has encouraged the use of this fish by people who have been prejudiced against its use for food. Among the services performed may be mentioned that of establishing connections between producers seeking markets and the trade in the larger consuming centers.

A number of the States have also appreciated the importance of utilizing more of the carp and other less-esteemed species, such as the buffalofish and suckers, to relieve the food shortage in the present time of stress. Noteworthy among these are Wisconsin and Minnesota. During the period from September 1, 1917, to April 1, 1918, under the supervision of the State Conservation Commission of Wisconsin, 1,264,680 pounds of carp, buffalofish, and suckers were taken from the inland waters of that State. As an immediate result of the action of the Game and Fish Department of Minnesota in suspending regulations in so far as they apply to the capture of rough fish,

1,382,187 pounds of carp were taken and marketed between October 1, 1917, and February 1, 1918.

Drum.—The common drum is found on the coasts of the Middle Atlantic, South Atlantic and Gulf States, sometimes in very large schools. It is a bottom feeder, subsisting largely upon crustaceans and mollusks, and reaches a weight of about 150 pounds. Personal prejudice, because of the presence of muscle parasites in the posterior part of the back, has greatly restricted the use of this important food fish. On the other hand, some persons familiar with this condition consider the infested portion the most desirable part of the fish. While the fish may be marketed fresh or preserved in various ways, it is as a canned product that it is most appetizing. Prepared in this manner, it has been likened to the meat of chicken.

The Bureau has given considerable attention to the development of markets for this fish, but, because of the irregular movements of the schools, some difficulty has been encountered in obtaining steady sources of supply. It is expected, however, that this difficulty will be overcome and that larger quantities of this wholesome fish will be made available.

Whales and porpoises.—Whales and porpoises being mammals and their bodily activities being essentially the same as those of a cow, horse, or other land mammal, their flesh is "meat" rather than "fish." The meat of the whale resembles beef in texture and appearance, and, although by some it has been compared to venison in taste, it nevertheless has a distinctive flavor of its own. A sample of canned whale meat, analyzed by the Bureau, contained 30.11 per cent protein, 6.52 per cent fat, and 1.8 per cent ash. Of the whales, the humpback (*Megaptera nodosa*) is probably the best for food, but the sei whale (*Balænoptera borealis*) and the finback (*Balænoptera velifera*) also yield excellent meat. From a humpback whale about 6 tons of edible meat may be obtained, from the sei whale 5 tons, and from the finback 8 tons. The whales which are largely available for food subsist almost entirely on a small shrimp (*Euphausia*). In fact, none of these whales eat fish habitually and only do so at all when shrimp are not to be obtained.

Whale meat holds an important place in the dietary of the Japanese and is growing in favor in other countries. The Bureau has emphasized the importance of utilizing this product for food, and very satisfactory progress has been made in saving and marketing it. On the west coast one whaling company in August, 1917, completed a 25-ton cold-storage plant, with a sharp freezer to care for 50 tons, and during the season marketed over 80 tons of the fresh meat in American markets, principally in west-coast cities. Arrangements have been made for marketing 500 to 600 tons during the 1918 fishing season, and shipments are being made in carload lots as far east as Boston. A British Columbia plant also marketed a large amount of the fresh meat and was prepared to pack about 50,000 cases of the canned meat in 1918.

Porpoises and dolphins are excellent for food, by some preferred to the larger whales. The Bureau has been instrumental in bringing the value of these forms to the attention of fishermen on the Atlantic and Gulf coasts, and progress is being made in the establishment of

markets for the meat of these creatures. It appears that the oily taste, which may be more or less objectionable to some, can be avoided by removing the connective tissue which lies between the blubber and the meat.

UTILIZATION OF FISH WASTE AND WASTE FISH.

Twenty-five per cent or more of the original weight of fish is inedible. It is possible to convert this residue into products of high market value, and more of it should be so employed instead of being wasted. In the salmon fisheries of the Pacific coast alone it is estimated that the value of this material, if fully utilized, would amount to several million dollars annually. It is also possible to manufacture much of this refuse and such fishes as the menhaden into products having a high economic value. For example, the scrap made from menhaden may be converted into fish meal as a feed for hogs, poultry, and cattle, rather than into fertilizer with which to grow feeds. The best use man can make of fish is to eat it. In like fashion, the best use for fish scrap is to feed it to stock intended to supply the wants of man. By the employment of the animal manure as a fertilizer, it can be made to serve both purposes.

In the case of fish meal greater progress has been made abroad than in the United States. For a number of years before the war, the Germans not only used all they could produce but imported many thousand tons annually from Great Britain and Norway. Considering the costs of transportation, manufacture, and distribution, it is evident that the product was highly valued. Feeding experiments conducted abroad and in this country have demonstrated this value.

One cause that has militated against the use of this product has been the impression that the flesh of animals to which it is fed will become flavored thereby. This feeling is presumably due to the fact that the flesh of animals reared in fishing camps and villages and supplied with an excessive or unlimited diet of fish acquires a fishy taste. As a matter of fact, if the animals are fed intelligently on fish meal with a low oil content, no untoward effects will be experienced.

Fish meal may be prepared by the same general methods as are now employed in the manufacture of the scrap for fertilizer; that is, by steam cooking, pressing, and drying. In addition, it may be necessary to grind it for the purpose of breaking up such sharp spines and pointed bones as remain. It should be made from fresh raw material, under sanitary conditions, dried at a sufficiently low temperature to prevent scorching, and should contain preferably not more than 10 per cent of fat (oil). It is suggested that those employing hot-air driers use charcoal or anthracite and avoid the use of long-flaming fuels to prevent scorching. It should be evident that the higher the percentage of oil in the meal, the greater will be the care required in feeding it. As fish meal is a protein food, it is to the advantage of the producer to reduce the oil content to a minimum, and thus obtain a higher protein (ammonia) analysis. Furthermore, the oil has a higher value when sold as such than if left in the meal.

The higher grades of tankage, with a guaranteed protein content of 60 per cent, are used extensively for feeds, and command as much as $100 per ton or more in carload lots. The supply of this material is inadequate. Experiments conducted by the Department of Agriculture indicate that fish meal is fully the equal of tankage as a feed. As to demand, it has been estimated that Nebraska alone can use 30,000 to 40,000 tons annually. In the United States, there are grown each year 60,000,000 or more hogs, each of which will require an average of not less than 50 pounds of a feed of this character. From the evidence at hand it would appear that satisfactory markets are assured.

On the west coast and in New England the production of fish meal is increasing. In 1917 the reported output in the Pacific Coast States and Alaska was 5,297 tons, an increase of more than 100 per cent over the previous year. Considering the demand and the importance of this product to the country, it is imperative that those engaged in the fisheries render all possible aid to meet the demand.

The subject of rendering fish oils suitable for edible purposes is also receiving more attention. In 1914 Denmark used 20,000 barrels of hardened whale fat in the margarin industry, and more recently Norway has been experimenting with this article and is preparing to employ it for the same purpose. It is reported that this product has been proved to be well suited for making margarin that keeps well and tastes well, and to be even better suited for making lard. Experiments are in progress in the United States with fish oils to determine the practicability of rendering these suitable for edible purposes and marketing them commercially.

The Bureau has continued its efforts to accomplish a more complete utilization of fish waste to the best possible advantage. The importance of doing this has been brought directly to the attention of those engaged in the industry, and many inquirers in this country and abroad have been furnished with data relative to methods, machinery, and markets. On the Atlantic seaboard the Bureau has interested menhaden companies in the production of fish meal. In this field it has had the cooperation of the Bureau of Animal Industry of the Department of Agriculture in bringing the use of this product to the attention of hog growers, in giving suggestions relative to preparing the product so that it will be acceptable for feeding purposes, and in arranging for additional feeding experiments at various agricultural experiment stations. Tangible results have already been obtained, and it is expected that ultimately this fishery will yield annually about 40,000 tons of this material. The Bureau's efforts to establish fisheries for grayfish and other species of sharks has been of benefit to the fish-oil industry in that those engaging in these fisheries have been interested to recover and market the liver oil.

HOME CANNING OF FISH.

Although the preservation of fish in the home by canning affords an excellent opportunity for the increased saving of fish, the housewife has made little use of this method. With the development of small pressure cookers, purchasable at reasonable cost, it is possible for the housewife to process fish in the home, duplicating the work

of the commercial canner. In this manner she may practice a measure of economy and provide a supply of palatable and nutritious food in seasons of the year when fish are abundant for use in periods of scarcity.

The primary object of "processing" fish, or cooking them under steam pressure, is to sterilize them to prevent spoiling. An additional advantage of the method is that if the heating is continued for a sufficient length of time, the organic matter in the bones is dissolved, leaving only a soft, friable, mineral matter that can be eaten along with the meat. With the bones thus softened the fish is much more acceptable as food. Thus, small bony fishes that would otherwise be useless, or fishes of small market value, may be saved, and the larger staple fishes made more attractive.

The time required to soften the bones of fishes varies with the species, the size of the fish, and the pressure and temperature employed. In domestic canning, unless the required time is known, time and fuel may be wasted by overcooking, or by insufficient cooking the bones may not be properly softened.

A recent journal article calls attention to the small amounts of calcium present in most of the common foods and presents a table showing that comparatively large amounts of the ordinary foods are required to yield four-tenths gram of calcium oxide per day, which is about one-half the daily requirement of the average adult. The bones of fish, properly softened as they are by domestic or commercial canning, render available an abundant amount of calcium in acceptable form, not encountered in such amounts in any other common food. In addition to this they supply phosphoric acid and other valuable minerals. It is, therefore, not only good housekeeping, but good dietetics, to can fish for home use.

The Bureau has conducted experiments to determine the time required to soften the bones of about 30 common marine and freshwater fishes of different sizes. In the table which follows the time given is that determined experimentally for the sizes mentioned. It will be a simple matter to interpolate the time periods required to soften the bones of fishes of the same species but of sizes different from those represented. The term "softening," as here used, means the point in cooking when the small bones, ribs, etc., are soft, but when the large vertebræ are not yet sufficiently soft to be consumed along with the muscle. In some of the larger fishes whose large bones could scarcely be eaten, even if they were softened, it would appear to be a waste of time and fuel to carry them to the point of complete cooking, and in such cases it ought to be sufficient to soften the small bones and sterilize the contents of the can. For such a purpose the "softening" rather than the "soft" point may be used.

These experiments refer to fish cooked in Mason glass jars of quart size. The time periods are measured from the point when the given pressure and temperature are reached (at the top of the cooker) to the time when the heat is shut off. The heating-up and cooling-off periods of time are thus not included. The fish were salted, but no water was added. Samples of fish canned during the course of these experiments were kept six weeks at room temperature (about 68° F.) and were then incubated at 98° for 48 hours. All were sterile.

TIME REQUIRED TO SOFTEN THE BONES OF VARIOUS SPECIES OF FISH, 10 POUNDS PRESSURE, 240° F.

Species.	Weight.	Softening.	Soft.	Species.	Weight.	Softening.	Soft.
Black bass:	*Lbs.*	*Mins.*	*Mins.*	Lemon sole:	*Lbs.*	*Mins.*	*Mins.*
Large	5 - 6	100	120	Large	2½- 3½	80	90
Small	¾- 1	100	110	Small	½- 2	60	70
Bluefish:				Mackerel, medium	¾- 1½	60	70
Large	6 - 9	90	100	Mackerel, Spanish, medium	1½- 2½	100	110
Small	1 - 2	80	90	Perch, white, medium	½- ¾	100	110
Butterfish, medium	½- ½	60	80	Perch, yellow, medium	½- ¾	90	100
Carp	8 -12	110	120	Pollock, medium	5 - 7½	60	70
Catfish:				Salmon, medium	13 -19	90	100
Large	1½- 2	70	80	Sea bass, medium	1 - 1½	60	70
Small	¾	60	70	Shad	5½	90	100
Cero, medium	10 -13	80	90	Smelt:			
Cod:				Large	(a)	60	70
Large	6 -16	80	90	Small	(b)	50	60
Small	1 - 2	50	60	Snapper, red:			
Croaker:				Large	10 -15	110	120
Large	¾- 1	90	100	Small	5- 6	90	100
Small	½- ¾	50	60	Squeteague:			
Eel	2 - 3½	100	110	Large	2½- 4	80	90
Flounder:				Medium	2	60	70
Large	1 - 1½	70	80	Small	¾- 2	50	60
Small	½- 1	50	60	Striped bass:			
Haddock:				Large	10-15	110	120
Medium	3 - 5	60	70	Small	¾- 1½	70	80
Small	1 - 2	50	60	Sucker, medium	½- 1½	80	90
Halibut, medium	50 -90	70	80	Tilefish, medium	6 -12	90	100
Hickory shad, medium	1½- 2	60	70	Whiting, medium	½- 1	50	60
Hogfish	¼	50	60				
Kingfish, medium	½- 1	60	70				

[a] From 5 to 7 to the pound. [b] From 15 to 20 to the pound.

Some experiments have recently been made to apply a known principle to the domestic canning of fish so as to obviate the necessity for employing a pressure cooker. The reference is to boiling the cans or jars in a saturated salt solution; that is, at 228° F. for a time. For this process, only apparatus usually found in the home, such as a wash boiler, is employed. By this method, the bones are softened satisfactorily and the fish thoroughly cooked, and difficulties in closing fruit jars to withstand the pressure created are overcome. Nearly 100 containers of glass and tin have been processed and some success has been attained. It is planned to make additional tests before recommending the use of the method to the public.

DEVELOPMENT OF AQUATIC SOURCES OF LEATHER.

The Bureau has continued to cooperate effectively with tanners, fishermen, and others interested in the development of new sources of leather from the skins of aquatic animals. Among the advances to be recorded in this work during the past year the following may be mentioned: (1) The development of types of nets suitable for catching sharks and devices claimed to be satisfactory for quickly removing the hides from the fish; (2) progress in the development of methods suitable for tanning the hides of the smaller fishes on a commercial scale; (3) perfection of arrangements by tanners to engage in the industry; (4) establishment of connections with the fishing centers for supplies of raw materials; (5) preparations for the establishment at various points on our coasts of small plants for fishing for sharks, the flesh to be used for food, the liver oil to be extracted and marketed, the hides to be tanned into leather, and the refuse to be

used for fertilizer; and (6) experiments with leather made from fish skins to determine fitness for manufacture into shoes and other articles. The Bureau has also given assistance in expediting shipments of raw hides from producing centers to tanners.

A seine constructed for the Bureau, which has proved very successful for the capture of sharks up to 6 or 8 feet in length, is 600 yards long, 18 feet deep, with 4-inch bar mesh of 36 thread; top and bottom lines of one-half inch, 18-thread rope, fitted with seine corks 5 inches in diameter placed 2 feet apart on the cork line, and 4-ounce trap leads with the same interspace on lead line, the entire net being tarred. With this type of apparatus, from 50 to 200 sharks have been taken in a single day's fishing, and during the brief period in which two of these nets have been operated, approximately 2,000 sharks ranging in length from 3½ to 15 feet have been taken. For the purpose of taking the larger sharks a heavier net of larger mesh is required. One now under construction which the Bureau believes will prove satisfactory is 300 yards long, 12 feet deep, with 10-inch bar mesh of 60-thread tarred cotton twine hung on three-eighths inch 12-thread rope, fitted with haul-seine corks 4 inches in diameter placed 3 feet apart on cork line and 2-ounce round leads placed 6 feet apart on lead line.

Through the cooperation of the Bureau of Standards the services of a technically trained tanner were obtained, and some tanning experiments were started at a large tannery with the company's cooperation. The tanner remained in this work only a short time before entering the military service and the results accruing should be credited largely to the company. The experiments showed that shark skins could be tanned into upper leather for shoes by known methods of tanning and also that the shagreen could be removed from the skins very satisfactorily. To do this, the hides, after tanning and neutralizing, are first coated with paraffin and oil, tacked and dried. They are then smooth plated and shaved on the grain side to remove the coarest part of the denticles, and the grain is then gone over lightly on a rapidly revolving carborundum wheel. After this treatment the hides are ready for finishing. Some of the hides have been given a gun-metal finish suitable for shoes, others have been tanned for lining leather and as cordovan. The average tensile strength of two shark skins submitted to the Bureau was 3,905 and 4,742 pounds per square inch.

Owing to shortage of labor, transportation difficulties, and other drawbacks, progress in the development of this industry has been somewhat retarded. In fact, it has practically become necessary for the tanning companies to start fisheries of their own at various points along the coast to insure a supply of raw materials at the present time. With the increase in demand for shark meat and oil, the fishermen are showing increased interest in the fishery, and the outlook is regarded as promising.

NEW ENGLAND VESSEL FISHERIES.

The vessel fisheries centering at Boston and Gloucester, Mass., and Portland, Me., have been in a prosperous condition during the past year. There was some decrease in the quantity of fishery products

landed, but a large increase in the value, as compared with the previous year. The decline in quantity occurred at Gloucester and Portland, while there was considerable increase over the previous year in the receipts at Boston. Statistics of these fisheries have been collected during the year by the local agents and published in monthly bulletins showing by species and fishing grounds the quantities and values of fishery products landed by American fishing vessels at these ports. Two annual bulletins also have been issued, one showing the catch by months, and the other by fishing grounds.

The fishing fleet which landed fishery products at these ports during the calendar year 1917 included 493 sail, steam, and gasoline screw vessels. These vessels landed at Boston 2,962 trips, aggregating 98,650,139 pounds of fish, valued at $5,166,440; at Gloucester, 3,074 trips, aggregating 58,134,944 pounds, valued at $2,451,484; at Portland, 3,248 trips, aggregating 18,645,503 pounds, valued at $743,408. The total for the three ports amounted to 9,284 trips, aggregating 175,430,586 pounds of fresh and salted fish, having a value to the fishermen of $8,361,332. Compared with the previous year there was an increase of 339 trips, and a decrease of 10,393,839 pounds, or 5.59 per cent, in the quantity, with an increase of $1,977,426, or 30.97 per cent, in the value of the fish landed. The catch of haddock decreased 7,000,957 pounds, hake 5,257,653 pounds, pollock, 1,095,838 pounds, cusk, 2,518,994 pounds, halibut 1,692,701 pounds, herring 5,494,676 pounds, and miscellaneous products 2,232,214 pounds, but all of these species except cusk, halibut, herring, and the miscellaneous products increased in value. The catch of Newfoundland herring decreased 4,462,479 pounds, or 39.58 per cent, in quantity, and $98,202, or 30.12 per cent in value. The cod catch increased 12,823,966 pounds, or 29.39 per cent, in quantity, and $813,952, or 52.28 per cent, in value, and the mackerel catch 1,535,714 pounds, or 9.65 per cent, in quantity and $404,831, or 38.58 per cent, in value. There was also an increase in the catch of swordfish of 201,206 pounds, or 11.35 per cent, in quantity, and $53,890, or 22.61 per cent, in value. The catch of tilefish landed at Boston during the year amounted to 1,211,450 pounds, valued at $44,743, an increase over the previous year of 338,308 pounds, or 38.74 per cent, in quantity and $20,448, or 84.16 per cent, in value.

The following tables present in detail, by fishing grounds and by months, the products of the vessel fisheries of Boston and Gloucester, Mass., and Portland, Me., for the calendar year 1917. The weights of fresh and salted fish given in these statistics represent the fish as landed from the vessels, and the values are those received by the fishermen. The grades, or sizes, given for certain species are those recognized in the trade.

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN FISHING VESSELS DURING THE CALENDAR YEAR 1917, SHOWN BY FISHING GROUNDS.

Fishing grounds.	Number of trips.	Cod.											
		Large (10 pounds and over).				Market (under 10 and over 2½ pounds).				Scrod (1 to 2½ pounds).			
		Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.	
LANDED AT BOSTON.													
East of 66° west longitude.		*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
La Have Bank	21	271,580	$16,756			203,311	$8,419			31,960	$642		
Western Bank	172	2,538,097	150,585			2,322,057	104,093			164,664	4,027		
Quereau Bank	11	63,850	3,110			40,100	1,345						
Grand Bank	1												
St. Peters Bank	4	31,525	1,662			37,130	1,149			2,100	33		
Cape Shore	24	300,361	20,019			378,038	14,830			151,450	2,943		
St. Anns Bank	1	30,100	1,505			22,600	678			2,250	34		
West of 66° west longitude.													
Browns Bank	160	1,287,960	75,151			1,502,859	57,567			242,845	4,769		
Georges Bank	481	3,271,229	191,520			3,297,689	133,751			291,210	6,868		
Cashes Bank	11	32,440	1,632			20,205	789			5,685	108		
Fippenies Bank	6	37,470	2,547			16,455	766			5,830	160		
Middle Bank	162	104,197	8,053			96,154	6,347			33,419	857		
Jeffreys Ledge	516	276,544	20,428			248,510	13,592			69,140	1,749		
Ipswich Bay	2	175	15			460	28			200	4		
South Channel	251	811,777	51,097			1,011,060	46,269			272,820	5,664		
Nantucket Shoals	47	141,620	10,556			552,699	25,448			48,415	1,119		
Off Chatham	606	1,968,538	119,555			2,015,108	87,160			507,869	10,071		
Off Race Point	26	1,000	50			790	40			175	5		
Bay of Fundy	1	11,900	397			3,500	105			500	8		
South Shore, general	39												
	350	185,853	10,477			136,343	5,563			42,274	947		
Total	2,962	11,366,216	685,115			11,905,068	507,939			1,872,806	40,008		

LANDED AT GLOUCESTER.													
East of 66° west longitude.													
La Have Bank	6	115,510	3,375	6,960	$348	30,690	810	3,455	$155	500	5		
Western Bank	20	506,489	15,929	109,433	5,566	538,345	15,851	198,320	9,315	133,225	1,489	21,620	$804
Quereau Bank	144	5,464,522	160,241	2,347,016	121,556	8,812,975	232,222	3,038,226	144,335	253,866	3,165	253,496	9,301
Green Bank	1			8,000	420			1,740	78				
Grand Bank	17	392,490	11,957	301,305	15,725	23,815	695	43,985	1,903	50	2	960	30
Bacalieu Bank	1	62,735	1,882	36,000	1,800	2,525	69	1,540	69				
Off Newfoundland	27	20,528	551	30,635	1,582	6,380	153	11,460	516				
Cape North	2	95,200	2,973	37,480	1,874	41,795	1,079	16,360	736	5,770	75	1,140	34
Cape Shore	41	130,797	4,537	4,120	206	74,482	2,068	6,230	218	7,585	89	1,750	44
The Gully	8	268,130	8,195	8,120	390	36,307	1,000	2,989	119			180	5
West of 66° west longitude.													
Browns Bank	16	380,730	12,353			296,560	8,287			12,960	129		
Georges Bank	33	574,537	19,599	5,512	289	169,391	4,997	3,074	129	5,850	79	260	8
Middle Bank	1												
South Channel	2	41,670	1,399			28,729	862			485	5		
Nantucket Shoals	214	94,260	2,580			99,435	2,468						
Off Chatham	34												
Seal Island	2	18,430	645			6,717	201						
Shore, general	2,505	1,817,823	111,204										
Total	3,074	9,983,851	357,420	2,894,581	149,756	10,168,146	270,762	3,327,379	157,573	420,291	5,038	279,406	10,226
LANDED AT PORTLAND.													
East of 66° west longitude.													
La Have Bank	1	1,000	60			900	45						
Western Bank	22	980,100	32,286	22,000	1,210	88,350	2,978	5,000	238	1,965	36		
Quereau Bank	2	3,000	90	2,180	131	87,000	2,610	1,610	81				
Grand Bank	5	5,000	94	39,240	2,158			2,295	109				
St. Peters Bank	1												
Bacalieu Bank	1												
West of 66° west longitude.													
Browns Bank	2	10,410	554			3,370	94			360	7		
Georges Bank	4	8,740	274			11,865	354						
Cashes Bank	45	51,475	2,155			48,108	1,436			12,985	215		
Platts Bank	5	4,570	353			6,580	387			1,795	45		
Jeffreys Ledge	87	37,327	2,715			42,265	2,182			14,942	411		
South Channel	3	55,000	1,925										
Bay of Fundy	1	1,985	75			2,315	69			250	4		
Shore, general	3,069	1,294,352	81,448			1,095,722	42,530			284,728	7,638		
Total	3,248	2,452,959	122,029	63,420	3,499	1,386,475	52,685	8,905	428	317,025	8,356		
Grand total	9,284	23,803,026	1,164,564	2,958,001	153,255	23,459,689	831,386	3,336,284	158,001	2,610,122	53,402	279,406	10,226

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN FISHING VESSELS DURING THE CALENDAR YEAR 1917, SHOWN BY FISHING GROUNDS—Continued.

Fishing Grounds.	Haddock.								Hake.							
	Large (over 2½ pounds).				Scrod (1 to 2½ pounds).				Large (6 pounds and over).				Small (under 6 pounds).			
	Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.	
LANDED AT BOSTON.																
East of 66° west longitude.	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
La Have Bank	296,206	$17,595			85,610	$2,994			90,030	$4,497			149,555	$4,468		
Western Bank	8,025,694	423,282			4,440,717	150,069			14,994	778			80,366	3,392		
Quereau Bank	32,350	988			950	23							12,000	420		
St. Peters Bank	87,265	4,499			9,155	147			5,400	270			4,700	204		
Cape Shore	1,630,585	85,437			265,947	6,623			70,265	3,659			84,780	3,076		
St. Anns Bank	13,300	665			1,000	15							70	4		
West of 66° west longitude.																
Browns Bank	3,589,990	176,215			663,860	18,039			47,110	2,324			116,230	4,277		
Georges Bank	4,260,092	196,926			1,718,895	61,694			38,350	1,661			50,395	1,939		
Cashes Bank	13,385	720			610	20			19,625	1,348			87,098	3,763		
Fippenies Bank	23,230	642			4,735	194			3,550	205			7,400	335		
Middle Bank	484,402	36,984			51,851	2,158			104,780	7,555			477,285	21,462		
Jeffreys Ledge	1,846,918	128,250			328,796	15,367			181,437	13,643			1,007,251	51,557		
South Channel	7,108,997	352,413			2,834,585	99,300			184,819	9,154			428,096	16,787		
Nantucket Shoals	101,775	6,683			8,625	351			2,445	153			7,020	311		
Off Chatham	6,355,050	346,792			1,048,924	37,810			195,820	10,173			477,467	20,632		
Off Race Point	1,875	94											300	9		
Bay of Fundy	5,135	154							89,000	2,670						
Shore, general	166,048	9,857			10,055	407			266,844	14,789			675,853	25,025		
Total	34,042,297	1,788,206			11,474,315	395,211			1,314,469	72,879			3,665,866	157,661		

LANDED AT GLOUCESTER.																
East of 66° west longitude.																
La Have Bank	25,410	607	475	$14					81,505	1,955						
Western Bank	178,318	5,282	748	22	3,150	95			174,920	4,199	3,350	$179				
Quereau Bank	1,238,764	24,199	144,820	4,439	8,820	47			151,920	3,599	58,292	1,745				
Green Bank									17,884	492						
Grand Bank	735	15	4,285	149			600	$16	57,375	1,443	6,650	200				
Off Newfoundland			120	4					15,277	404	3,415	102				
Cape North	20,560	411	8,850	266					450	9						
Cape Shore	96,375	4,369	55	2					13,980	359	20	1				
The Gully	615	12							107,785	2,495	475	14	1,570	56		
West of 66° west longitude.																
Browns Bank	66,830	1,336			52,745	557			3,260	66						
Georges Bank	13,045	261	140	3					25,195	555						
South Channel	85	2														
Nantucket Shoals	11,325	227							11,130	273						
Seal Island	350	7							1,587	32						
Shore, general	932,775	56,249							71,588	5,673						
Total	2,585,187	92,977	159,493	4,899	64,715	699	600	16	733,856	21,555	72,202	2,241	1,570	56		
LANDED AT PORTLAND.																
East of 66° west longitude.																
La Have Bank																
Western Bank	3,083,385	107,989			38,540	1,286							4,070	163		
Quereau Bank									125	6			15,375	477		
Grand Bank									2,500	75	580	17	2,500	50		
West of 66° west longitude.									4,650	70					580	$16
Browns Bank	110	2														
Georges Bank	35,500	1,065			52,000	1,560							545	15		
Cashes Bank	13,535	805			4,155	136			16,903	736			40,860	1,372		
Platts Bank	5,787	464			622	31			1,155	81			9,249	408		
Jeffreys Ledge	257,014	19,228			30,365	1,247			39,677	2,633			161,642	6,733		
South Channel	397,800	14,151			45,500	1,365										
Bay of Fundy	150	5							7,100	284			11,410	349		
Shore, general	1,188,487	82,075			75,278	3,285			302,545	18,642	300	17	1,503,488	54,779	1,429	70
Total	4,981,768	225,784			246,460	8,910			374,655	22,527	880	34	1,749,139	64,346	2,009	86
Grand total	41,609,252	2,106,967	159,493	4,899	11,785,490	404,820	600	16	2,422,980	116,961	73,082	2,275	5,416,575	222,063	2,009	86

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN FISHING VESSELS DURING THE CALENDAR YEAR 1917, SHOWN BY FISHING GROUNDS—Continued.

Fishing grounds.	Pollock.				Cusk.				Halibut.			
	Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
LANDED AT BOSTON.												
East of 66° west longitude.												
La Have Bank	27,015	$862			116,605	$4,054			9,682	$1,789		
Western Bank	453,212	17,737			42,825	1,370			56,409	11,606		
Quereau Bank	1,125	33			22,245	730			111,291	15,190		
Grand Bank									46,000	3,680		
St. Peters Bank	300	11							5,010	1,163		
Cape Shore	26,560	937			152,599	5,302			12,438	2,557		
West of 66° west longitude.												
Browns Bank	220,352	9,185			707,848	23,120			96,028	17,309		
Georges Bank	517,856	21,699			118,452	4,075			58,940	10,378		
Cashes Bank	13,305	466			81,940	2,857			618	110		
Fippenies Bank	21,190	859			51,345	1,910			1,747	365		
Middle Bank	195,741	8,172			118,383	4,555			1,018	303		
Jeffreys Ledge	918,088	43,916			337,293	13,409			10,080	1,890		
Ipswich Bay	6,390	392										
South Channel	281,356	12,768			43,940	1,553			33,078	5,473		
Nantucket Shoals	30,863	1,370			8,315	338			4,516	676		
Off Chatham	931,159	44,566			95,940	3,151			37,826	6,692		
Off Race Point	1,590	80										
Bay of Fundy	1,100	17			9,650	228			600	120		
Shore, general	361,077	15,474			144,668	4,764			5,197	740		
Total	4,008,279	178,544			2,052,048	71,416			490,478	80,041		
LANDED AT GLOUCESTER.												
East of 66° west longitude.												
La Have Bank	2,640	46			146,575	3,303			92,655	11,375		
Western Bank	12,835	237	2,651	$80	98,790	2,296	95	$4	59,833	6,126	786	$45
Quereau Bank	121,788	2,204	34,457	1,050	28,027	677	13,970	400	194,842	16,134	27,017	2,029
Green Bank			647	19	1,200	29			45,000	6,350	45	5
Grand Bank	1,475	28	275	8	22,492	522	5,815	188	165,647	14,112	12,380	1,354
Bacalieu Bank									12,475	1,115	16	1
Off Newfoundland	3,250	57	600	18					8,730	1,020	130	6
Cape North									5,550	301	1,990	164
Cape Shore	8,822	161	240	7	42,870	922	475	14				
The Gully	4,305	78	400	10	30,725	716	50	2	138,404	18,091		

West of 66° west longitude.												
Browns Bank	9,045	166			37,730	684						
Georges Bank	11,543	205	600	12	80,075	1,867			168,134	19,441		
Nantucket Shoals	1,310	23			29,350	692			2,830	213		
Seal Island	1,020	19			59,314	1,113			13,670	2,095		
Shore, general	8,959,626	350,895										
Total	9,137,659	354,119	39,870	1,204	577,148	12,821	20,405	608	907,770	96,373	42,364	3,604
LANDED AT PORTLAND.												
East of 66° west longitude.												
La Have Bank	325	13			1,125	45			23,766	3,995		
Western Bank	60,625	1,108			21,130	505			65,319	8,667		
Quereau Bank	395	12							19,697	1,917		
Grand Bank	940	13							131,541	13,018		
St. Peters Bank									35,818	5,903		
Bacalieu Bank									24,170	2,970		
West of 66° west longitude.												
Browns Bank	1,965	40			540	19			1,458	292		
Georges Bank	1,985	59			3,980	100			432	65		
Cashes Bank	17,759	467			208,607	5,946			2,435	359		
Platts Bank	3,739	145			11,850	478			147	21		
Jeffreys Ledge	37,367	1,525			90,685	3,927	1,055	21	3,033	343		
South Channel	3,265	41							3,414	222		
Bay of Funday	250	5			6,950	177			16	2		
Shore, general	1,192,957	41,961	412	12	551,335	23,001	2,445	50	14,206	1,440		
Total	1,321,572	45,389	412	12	896,202	34,198	3,500	71	325,452	39,214		
Grand total	14,467,510	578,052	40,282	1,216	3,525,398	118,435	23,905	679	1,723,700	215,628	42,364	3,604

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN FISHING VESSELS DURING THE CALENDAR YEAR 1917, SHOWN BY FISHING GROUNDS—Continued.

Fishing grounds.	Mackerel.											
	Large (over 2¼ pounds).				Medium (1½ to 2¼ pounds).				Small (under 1½ pounds).			
	Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
LANDED AT BOSTON.												
East of 66° west longitude.												
Western Bank	15,000	$1,650			82,345	$9,491						
Cape Shore	1,739,227	91,563	173,700	$10,497	221,663	8,966						
West of 66° west longitude.												
Georges Bank	394,160	33,550	43,400	4,288	46,326	2,134						
Middle Bank	211,696	21,993	1,400	210	224,460	28,030						
South Channel	8,200	1,057										
Nantucket Shoals	106,205	10,300			43,265	2,112					3,600	$504
Off Chatham	1,588,407	121,141			1,076,918	76,343					48,800	5,480
Off Race Point	232,489	25,212			376,827	40,396			638,614	$47,420	146,200	15,529
South	8,899	1,022			880	62			12,435	1,119		
Shore, general	1,535,518	127,837	1,400	210	501,862	43,617	3,600	$270	282,050	24,707	73,410	6,884
Total	5,839,801	435,325	219,900	15,205	2,574,546	211,151	3,600	270	933,099	73,246	272,010	28,397
LANDED AT GLOUCESTER.												
East of 66° west longitude.												
Cape North	65,715	4,303	495,300	36,299	76,517	4,709	714,800	51,806				

West of 66° west longitude.												
Georges Bank							79,000	8,460				
Middle Bank			54,200	8,808								
Nantucket Shoals	33,710	2,360	536,200	82,078	378,252	18,728	824,389	99,906	997,684	49,379	1,736,427	202,102
Off Chatham					26,650	536	50,725	5,224	179,733	8,173	88,495	8,455
Shore, general	128,000	7,247	216,000	29,461	36,167	1,827	100,040	9,074	154,513	7,000	19,160	1,017
Total	227,425	13,910	1,301,700	156,646	517,586	25,800	1,768,954	174,470	1,331,930	64,552	1,844,082	211,574
LANDED AT PORTLAND.												
West of 66° west longitude.												
Shore, general	450,840	34,167			101,885	7,442			54,705	1,964		
Total	450,840	34,167			101,885	7,442			54,705	1,964		
Grand total	6,518,066	483,402	1,521,600	171,851	3,194,017	244,393	1,772,554	174,740	2,319,734	139,762	2,116,092	239,971

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN FISHING VESSELS DURING THE CALENDAR YEAR 1917, SHOWN BY FISHING GROUNDS—Continued.

Fishing grounds.	Miscellaneous.				Total.				Grand total.	
	Fresh.		Salted.		Fresh.		Salted.			
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
LANDED AT BOSTON.										
East of 66° west longitude.										
La Have Bank	19,465	$817			1,301,019	$62,893			1,301,019	$62,893
Western Bank	106,769	5,481			18,343,149	883,561			18,343,149	883,561
Quereau Bank					283,911	21,839			283,911	21,839
Grand Bank					46,000	3,680			46,000	3,680
St. Peters Bank	2,000	40			184,585	9,178			184,585	9,178
Cape Shore	23,321	2,079			5,057,234	247,991	173,700	$10,497	5,230,934	258,488
St. Anns Bank					69,320	2,901			69,320	2,901
West of 66° west longitude.										
Browns Bank	88,808	4,756			8,563,890	392,712			8,563,890	392,712
Georges Bank	2,162,938	284,996			16,226,532	951,191	43,400	4,288	16,269,932	955,479
Cashes Bank	9,925	284			284,836	12,097			284,836	12,097
Fippenies Bank	4,425	99			177,377	8,082			177,377	8,082
Middle Bank	101,617	3,361			2,205,003	149,830	1,400	210	2,206,403	150,040
Jeffreys Ledge	483,961	12,660			5,708,018	316,461			5,708,018	316,461
Ipswich Bay	1,365	66			8,590	505			8,590	505
South Channel	727,646	25,827			13,746,374	627,362	3,600	504	13,749,974	627,866
Nantucket Shoals	52,994	1,437			1,108,757	60,854	48,800	5,480	1,157,557	66,334
Off Chatham	686,679	17,110			17,624,319	948,616	146,200	15,529	17,770,519	964,145
Off Race Point	2,230	176			629,711	67,181			629,711	67,181
Bay of Fundy	1,700	136			123,085	3,835			123,085	3,835
South Shore, general	[a] 1,211,450	44,743			1,221,229	45,827			1,221,229	45,827
	928,048	21,758			5,241,690	305,972	78,410	7,364	5,320,100	313,336
Total	6,615,341	425,826			98,154,629	5,122,568	495,510	43,872	98,650,139	5,166,440
LANDED AT GLOUCESTER.										
East of 66° west longitude.										
La Have Bank					495,485	21,477	10,890	517	506,375	21,994
Western Bank					1,705,905	51,504	337,003	16,015	2,042,908	67,519
Quereau Bank					16,275,524	442,488	5,917,294	284,855	22,192,818	727,343
Green Bank					64,084	6,871	10,432	522	74,516	7,393
Grand Bank					664,079	28,774	376,255	19,573	1,040,334	48,347
Bacalieu Bank					77,735	3,066	37,556	1,870	115,291	4,936
Off Newfoundland	[b] 487,946	15,484	[b] 6,321,810	$212,317	542,111	17,669	6,368,170	214,545	6,910,281	232,214
Cape North					169,325	4,848	65,820	3,074	235,145	7,922
Cape Shore					517,143	21,517	1,222,990	88,597	1,740,133	110,114
The Gully					587,841	30,643	12,214	540	600,055	31,183

West of 66° west longitude.										
Browns Bank					859,860	23,578			859,860	23,578
Georges Bank					1,047,770	47,004	88,586	8,901	1,136,356	55,905
Middle Bank							54,200	8,808	54,200	8,808
South Channel					70,969	2,268			70,969	2,268
Nantucket Shoals					1,659,286	76,943	3,097,016	384,086	4,756,302	461,029
Off Chatham					206,383	8,709	139,220	13,679	345,603	22,388
Seal Island					101,088	4,112			101,088	4,112
Shore, general	2,917,018	34,784			15,017,510	574,879	335,200	39,552	15,352,710	614,431
Total	3,404,964	50,268	6,321,810	212,317	40,062,098	1,366,350	18,072,846	1,085,134	58,134,944	2,451,484
LANDED AT PORTLAND.										
East of 66° west longitude.										
La Have Bank	520	99			31,706	4,420			31,706	4,420
Western Bank	25,877	2,146			4,380,791	157,484	27,000	1,448	4,407,791	158,932
Quereau Bank	9,795	156			124,887	4,910	4,370	229	129,257	5,139
Grand Bank	24	1			142,155	13,196	42,115	2,283	184,270	15,479
St. Peters Bank					35,818	5,903			35,818	5,903
Bacalieu Bank					24,170	2,970			24,170	2,970
West of 66° west longitude.										
Browns Bank	13,392	1,936			31,605	2,944			31,605	2,944
Georges Bank	33,803	4,791			148,850	8,283			148,850	8,283
Cashes Bank	283,767	3,097			700,589	16,724			700,589	16,724
Platts Bank	4,310	88			49,804	2,501			49,804	2,501
Jeffreys Ledge	189,788	2,492			904,105	43,436	1,055	21	905,160	43,457
South Channel					504,979	17,704			504,979	17,704
Bay of Fundy	400	16			30,826	986			30,826	986
Shore, general	3,345,564	57,445			11,456,092	457,317	4,586	149	11,460,678	457,966
Total	3,907,240	72,267			18,566,377	739,278	79,126	4,130	18,645,503	743,408
Grand total	13,927,545	548,361	6,321,810	212,317	156,783,104	7,228,196	18,647,482	1,133,136	175,430,586	8,361,332

[a] Tilefish.

[b] Herring. Other items under "Miscellaneous" include bluebacks, 63,438 pounds, value $706; bonito, 100 pounds, value $2; butterfish, 21,907 pounds, value $1,900; catfish or wolffish, 207,138 pounds, value $6,131; eels, 4,720 pounds, value $408; flounders, 1,279,721 pounds, value $44,936; grayfish, 6,100 pounds, value $41; herring, 6,328,808 pounds, value $70,813; horse mackerel, 3,500 pounds, value $90; redfish, 181,827 pounds, value $3,877; salmon, 448 pounds, value $84; shad, 153,393 pounds, value $8,146; sharks, 63,673 pounds, value $1,799; skates, 700,366 pounds, value $18,412; smelt, 50,686 pounds, value $4,914; sturgeon, 2,235 pounds, value $190; swordfish, 1,973,518 pounds, value $292,169; tomcod, 40 pounds, value $2; whiting, 1,300 pounds, value $27; porpoise, 400 pounds, value $2; lobster, 862 pounds, value $224; squid, 20,935 pounds, value $301; livers, 959,420 pounds, value $19,780; sounds, 53,335 pounds, value $3,805; spawn, 148,591 pounds, value $9,334; and tongues, 1,688 pounds, value $41.

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN FISHING VESSELS DURING THE YEAR 1917, SHOWN BY MONTHS.

Month.	Number of trips.	Cod.											
		Large (10 pounds and over).				Market (under 10 and over 2½ pounds).				Scrod (1 to 2½ pounds).			
		Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.	
LANDED AT BOSTON.		*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
January	191	370,473	$23,651	.....	.....	414,598	$15,504	.....	.....	145,889	$2,938	.....	.....
February	197	451,092	35,236	.....	.....	557,967	25,486	.....	.....	142,178	3,124	.....	.....
March	214	628,434	41,311	.....	.....	542,452	22,505	.....	.....	75,157	1,644	.....	.....
April	177	679,208	37,651	.....	.....	662,725	27,556	.....	.....	105,865	2,072	.....	.....
May	198	1,527,822	63,929	.....	.....	1,059,281	36,330	.....	.....	106,135	2,036	.....	.....
June	252	1,178,574	55,091	.....	.....	1,209,132	43,142	.....	.....	187,417	3,445	.....	.....
July	327	976,752	61,566	.....	.....	1,362,241	58,161	.....	.....	174,780	3,609	.....	.....
August	394	800,575	55,371	.....	.....	1,194,147	54,818	.....	.....	211,625	4,474	.....	.....
September	292	1,063,921	70,519	.....	.....	1,303,596	58,347	.....	.....	204,037	4,492	.....	.....
October	326	1,086,202	77,524	.....	.....	1,306,912	56,775	.....	.....	172,039	4,003	.....	.....
November	223	1,503,971	86,861	.....	.....	1,200,334	56,100	.....	.....	133,856	3,119	.....	.....
December	171	1,099,192	76,405	.....	.....	1,091,683	53,215	.....	.....	213,828	5,052	.....	.....
Total	2,962	11,366,216	685,115	.....	.....	11,905,068	507,939	.....	.....	1,872,806	40,008	.....	.....
LANDED AT GLOUCESTER.													
January	318	68,085	2,731	8,590	$430	41,000	1,027	8,170	$277	94,920	762	1,750	$44
February	144	131,178	11,565	4,685	234	2,665	80	2,804	112	.....	.....	260	8
March	265	488,159	34,499	9,880	492	4,052	102	5,200	208	.....	.....	330	10
April	328	813,464	39,235	.....	.....	184,245	5,071	.....	.....	9,330	93	.....	.....
May	518	1,357,050	53,227	2,952	161	738,226	21,872	1,079	49	24,855	250	.....	.....
June	172	1,584,237	51,296	786,070	39,865	1,897,136	56,235	771,253	35,062	41,306	673	62,607	2,081
July	91	1,654,530	49,599	646,356	32,066	2,303,712	62,620	512,360	22,765	71,725	756	33,555	1,169
August	189	2,240,854	61,926	671,513	33,792	3,306,487	81,703	727,340	33,291	120,700	1,799	72,572	2,497
September	111	971,668	27,111	234,355	12,094	1,267,100	31,082	291,155	12,808	30,100	349	27,397	851
October	105	404,334	12,186	351,305	18,873	333,133	8,502	593,698	27,827	15,870	206	26,935	975
November	495	183,032	8,572	177,785	11,692	79,605	2,173	412,320	25,084	10,135	130	52,980	2,560
December	338	87,260	5,473	1,140	57	10,725	295	2,000	90	1,350	20	1,020	31
Total	3,074	9,983,851	357,420	2,894,581	149,756	10,168,146	270,762	3,327,379	157,573	420,291	5,038	279,406	10,226

LANDED AT PORTLAND.

January	353	113,991	8,930			143,465	7,321			51,848	1,574			
February	350	107,928	8,602			107,237	6,021			32,196	1,226			
March	408	193,193	11,724	2,180	131	172,095	7,577			42,681	1,076			
April	351	220,775	11,199			184,449	6,794	1,610	81	37,362	804			
May	301	165,510	6,682			96,280	5,089			19,808	336			
June	269	109,619	4,204	39,240	2,158	39,004	1,177	2,205	109	10,130	157			
July	156	597,280	21,698	22,000	1,210	18,621	886	5,000	238	6,383	115			
August	183	457,964	18,252			104,679	3,495			4,033	81			
September	235	158,443	10,339			50,797	2,172			15,907	328			
October	160	204,065	9,704			301,381	3,747			20,285	492			
November	289	64,429	5,270			79,563	4,512			34,008	881			
December	193	59,702	5,425			88,904	5,894			42,384	1,286			
Total	3,248	2,452,959	122,029	63,420	3,499	1,386,475	52,685	8,905	428	317,025	8,356			
Grand total	9,284	23,803,026	1,164,564	2,958,001	153,255	23,459,689	831,386	3,336,284	158,001	2,610,122	53,402	279,406	10,226	
Grounds E. of 66° W. long	603	11,281,014	435,807	2,952,489	152,966	12,746,800	390,094	3,333,210	157,872	755,385	12,510	279,146	10,218	
Grounds W. of 66° W. long	8,681	12,522,012	728,757	5,512	289	10,712,889	441,292	3,074	129	1,854,737	40,892	260	8	
Landed at Boston in 1916	3,089	7,049,811	389,726			9,599,973	315,550			1,071,917	19,605			
Landed at Gloucester in 1916	2,864	7,725,906	225,800	4,446,695	209,857	6,610,007	148,109	2,783,712	115,512	379,201	3,058	298,725	8,739	
Landed at Portland in 1916	2,992	1,440,323	72,569	51,585	2,283	1,260,523	40,240	43,556	1,778	255,428	3,912	5,200	144	

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN FISHING VESSELS DURING THE YEAR 1917, SHOWN BY MONTHS—Continued.

Month.	Haddock.								Hake.							
	Large (over 2½ pounds).				Scrod (1 to 2½ pounds).				Large (6 pounds and over).				Small (under 6 pounds).			
	Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.	
LANDED AT BOSTON.	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
January	3,220,675	$173,863	.....	.....	1,461,342	$45,513	.....	.....	56,415	$4,113	.....	.....	182,391	$10,197	.....	.....
February	4,130,526	226,686	.....	.....	2,033,642	67,309	.....	.....	38,763	3,009	.....	.....	139,205	8,185	.....	.....
March	4,582,532	222,092	.....	.....	1,889,094	65,863	.....	.....	26,090	2,119	.....	.....	149,043	8,944	.....	.....
April	2,943,223	141,285	.....	.....	964,020	35,866	.....	.....	23,733	1,473	.....	.....	122,091	5,540	.....	.....
May	2,278,318	109,279	.....	.....	672,350	21,718	.....	.....	60,630	2,747	.....	.....	285,100	9,518	.....	.....
June	2,059,660	92,896	.....	.....	735,580	22,514	.....	.....	68,755	2,953	.....	.....	246,504	6,572	.....	.....
July	1,748,340	88,562	.....	.....	558,000	18,873	.....	.....	167,319	8,329	.....	.....	297,047	11,210	.....	.....
August	2,591,370	111,421	.....	.....	486,419	15,299	.....	.....	319,915	12,813	.....	.....	431,295	13,184	.....	.....
September	3,023,720	149,412	.....	.....	710,045	24,503	.....	.....	231,410	13,193	.....	.....	334,827	15,140	.....	.....
October	2,951,614	169,448	.....	.....	686,965	27,236	.....	.....	175,432	10,602	.....	.....	560,906	24,425	.....	.....
November	2,560,035	155,763	.....	.....	742,866	26,503	.....	.....	121,943	8,972	.....	.....	675,927	30,525	.....	.....
December	1,952,279	147,499	.....	.....	533,992	24,014	.....	.....	24,064	2,556	.....	.....	241,530	14,221	.....	.....
Total	34,042,297	1,788,206	.....	.....	11,474,315	395,211	.....	.....	1,314,469	72,879	.....	.....	3,665,866	157,661	.....	.....
LANDED AT GLOUCESTER.																
January	81,335	4,067	140	$5	.....	.....	.....	.....	18,846	1,468	20	$1	.....	.....	.....	.....
February	76,291	5,602	140	3	.....	.....	.....	.....	1,845	111	475	14	1,570	56	.....	.....
March	43,911	3,071	305	30	.....	.....	550	$14	6,060	109	260	8	.....	.....	.....	.....
April	364,383	18,169	.....	.....	.....	.....	.....	.....	1,810	37	.....	.....	.....	.....	.....	.....
May	622,834	32,621	.....	.....	3,000	60	.....	.....	9,920	182	.....	.....	.....	.....	.....	.....
June	320,844	6,421	24,365	787	49,745	497	.....	.....	35,127	736	55,055	1,652	.....	.....	.....	.....
July	493,745	9,585	45,435	1,363	8,400	42	.....	.....	73,205	1,541	5,350	160	.....	.....	.....	.....
August	289,534	5,605	36,273	1,088	420	5	.....	.....	253,225	6,103	2,682	81	.....	.....	.....	.....
September	184,835	3,667	36,735	1,076	.....	.....	.....	.....	134,576	3,369	4,300	125	.....	.....	.....	.....
October	24,680	505	5,945	192	.....	.....	50	2	128,070	3,140	3,920	196	.....	.....	.....	.....
November	76,620	3,255	10,155	355	3,150	95	.....	.....	44,571	2,359	.....	.....	.....	.....	.....	.....
December	6,175	409	.....	.....	.....	.....	.....	.....	27,501	2,400	140	4	.....	.....	.....	.....
Total	2,585,187	92,977	159,493	4,899	64,715	699	600	16	733,856	21,555	72,202	2,241	1,570	56	.....	.....

LANDED AT PORTLAND.																
January	200,085	13,721	.....	.....	17,263	804	.....	.....	13,138	1,155	.....	.....	45,323	2,079	.....	.....
February	81,477	5,783	.....	.....	10,197	438	.....	.....	6,387	567	.....	.....	47,662	2,155	.....	.....
March	301,666	17,162	.....	.....	36,761	1,423	.....	.....	9,928	791	580	17	56,265	2,371	.....	.....
April	623,843	25,662	.....	.....	37,272	1,442	.....	.....	64,617	3,676	.....	.....	54,393	2,384	.....	.....
May	226,893	11,915	.....	.....	8,141	187	.....	.....	23,429	1,015	.....	.....	169,891	4,299	.....	.....
June	78,485	3,097	.....	.....	54,249	1,625	.....	.....	31,616	1,085	.....	.....	202,919	4,611	580	$16
July	672,213	17,124	.....	.....	623	20	.....	.....	21,599	1,190	.....	.....	156,994	5,430	.....	.....
August	915,406	32,671	.....	.....	50,366	1,518	.....	.....	23,903	1,120	300	17	155,799	4,822	1,429	70
September	739,177	27,976	.....	.....	4,154	116	.....	.....	45,505	2,411	.....	.....	205,462	8,066	.....	.....
October	736,148	35,005	.....	.....	6,221	287	.....	.....	69,126	4,688	.....	.....	359,981	15,002	.....	.....
November	182,101	15,444	.....	.....	11,280	537	.....	.....	51,465	3,685	.....	.....	248,401	10,812	.....	.....
December	224,274	20,224	.....	.....	9,933	513	.....	.....	13,942	1,144	.....	.....	46,049	2,315	.....	.....
Total	4,981,768	225,734	.....	.....	246,460	8,910	.....	.....	374,655	22,527	880	34	1,749,139	64,346	2,009	86
Grand total	41,609,252	2,106,967	159,493	4,899	11,785,490	404,820	600	16	2,422,980	116,961	73,082	2,275	5,416,575	222,063	2,009	86
Grounds E. of 66° W. long.	14,729,562	675,350	159,353	4,896	4,853,889	161,299	600	16	809,060	24,311	72,782	2,258	354,986	12,310	580	16
Grounds W. of 66° W. long.	26,879,690	1,431,617	140	3	6,931,601	243,521	.....	.....	1,613,920	92,650	300	17	5,061,589	209,753	1,429	70
Landed at Boston in 1916	34,351,565	1,215,663	.....	.....	14,199,920	311,844	.....	.....	2,233,257	84,591	.....	.....	5,420,587	136,345	.....	.....
Landed at Gloucester in 1916	6,276,223	109,097	78,000	1,595	353,058	4,274	380	9	2,821,172	55,061	136,170	2,783	19,284	619	1,060	16
Landed at Portland in 1916	4,481,916	105,226	104,816	2,661	708,814	11,278	1,100	28	732,688	21,414	528	27	1,802,103	36,266	5,450	118

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN FISHING VESSELS DURING THE YEAR 1917, SHOWN BY MONTHS—Continued.

Month.	Pollock.				Cusk.				Halibut.			
	Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.	
LANDED AT BOSTON.	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
January	85,410	$3,202			187,078	$5,796			13,647	$3,794		
February	117,949	6,343			219,562	8,898			36,982	9,015		
March	115,635	7,034			191,495	8,156			32,422	5,729		
April	168,659	7,379			135,126	4,222			32,423	5,590		
May	246,002	9,016			202,250	5,890			70,091	9,577		
June	300,445	10,840			73,195	2,064			136,295	14,030		
July	476,466	23,421			133,284	4,418			17,487	3,046		
August	392,523	20,021			133,863	4,027			36,845	5,762		
September	560,872	27,085			177,860	6,287			26,824	5,321		
October	866,905	36,275			214,542	7,542			62,881	11,308		
November	426,253	16,070			215,496	7,599			16,617	4,351		
December	251,160	11,858			168,297	6,517			7,964	2,518		
Total	4,008,279	178,544			2,052,048	71,416			490,478	80,041		
LANDED AT GLOUCESTER.												
January	2,154,159	67,147	240	$7	110	2	475	$14	20,280	2,047		
February	173,991	11,025	600	12	400	12	50	2	35,885	6,018		
March	85,501	6,118	400	10	400	8			96,410	9,514		
April	183,071	8,205			20,890	344			8,656	904		
May	303,543	12,662			81,915	1,558			79,838	10,070		
June	438,151	6,995	11,510	345	44,221	1,004	5,815	188	222,489	18,815	21,196	$2,064
July	65,180	1,207	7,720	240	169,975	3,951	2,010	66	131,495	11,339	14,051	956
August	36,335	663	11,153	332	159,237	3,622			161,976	17,612	6,245	509
September	14,882	238	2,797	84	76,035	1,721			135,488	18,086	405	32
October	835,210	32,584	4,035	125	14,930	365	12,005	336	12,410	1,601	467	43
November	2,992,430	114,563	1,250	44	9,035	234			2,843	367		
December	1,855,206	92,712	165	5			50	2				
Total	9,137,659	354,119	39,870	1,204	577,148	12,821	20,405	608	907,770	96,373	42,364	3,604

LANDED AT PORTLAND.												
January	136,897	5,179			63,476	3,008	1,700	34	3,031	501		
February	169,898	7,844			40,295	2,154	455	10	130	20		
March	107,669	5,617	412	12	80,579	3,762	1,000	22	20,454	1,963		
April	212,018	6,991			209,789	7,440	65	2	2,725	358		
May	115,551	2,872			139,158	3,397			4,572	524		
June	68,760	1,320			28,845	806	280	3	67,784	6,204		
July	21,284	605			23,935	955			45,963	5,412		
August	54,358	1,002			11,274	495			98,008	11,823		
September	147,109	3,804			87,011	2,436			42,849	5,994		
October	111,854	3,543			59,242	2,575			36,440	5,996		
November	118,139	4,012			102,453	4,659			2,506	257		
December	58,035	2,600			50,145	2,511			990	162		
Total	1,321,572	45,389	412	12	896,202	34,198	3,500	71	325,452	39,214		
Grand total	14,467,510	578,052	40,282	1,216	3,525,398	118,435	23,905	679	1,723,700	215,628	42,364	3,604
Grounds E. of 66° W. long	725,612	23,537	39,270	1,192	727,208	20,471	20,405	608	1,264,277	147,079	42,364	3,604
Grounds W. of 66° W. long	13,741,898	554,515	1,012	24	2,798,190	97,964	3,500	71	459,423	68,549		
Landed at Boston in 1916	3,792,169	108,797			3,657,429	77,702			1,141,955	144,128		
Landed at Gloucester in 1916	10,117,193	236,060	78,168	1,635	1,553,926	22,263	34,000	889	1,686,252	175,285	95,244	8,510
Landed at Portland in 1916	1,593,125	36,721	22,975	403	805,172	18,450	17,770	166	535,314	57,662		

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER MASS., AND PORTLAND, ME., BY AMERICAN FISHING VESSELS DURING THE YEAR 1917, SHOWN BY MONTHS—Continued.

Month.	Mackerel.											
	Large (over 2¼ pounds).				Medium (1½ to 2¼ pounds).				Small (under 1½ pounds).			
	Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.	
LANDED AT BOSTON.	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
May	8,899	$1,022			880	$62						
June	1,892,719	103,122	173,700	$10,497	221,663	8,966	3,600	$270				
July	927,975	64,532	43,400	4,288	93,205	5,276			7,500	$575	9,200	$572
August	1,418,708	105,236			831,143	51,950			372,713	22,252	173,800	18,314
September	656,507	64,418	2,800	420	636,609	55,716			382,966	34,200	89,010	9,511
October	932,738	96,499			788,692	88,675			169,920	16,219		
November	2,255	496										
December					2,354	506						
Total	5,839,801	435,325	219,900	15,205	2,574,546	211,151	3,600	270	933,099	73,246	272,010	28,397
LANDED AT GLOUCESTER.												
June	78,025	4,488	495,300	36,299	77,547	4,802	724,440	52,551				
July	7,400	565	39,000	2,929	50,130	1,703	242,025	23,674				
August					266,821	12,624	433,993	50,045	1,099,430	52,363	1,240,942	134,716
September	108,290	6,497	177,000	26,532	115,798	6,992	314,296	40,371	232,500	12,189	603,140	76,858
October	33,710	2,360	585,600	90,142	7,240	579	38,000	5,468				
November			4,800	744			16,200	2,361				
Total	227,425	13,910	1,301,700	156,646	517,586	25,800	1,768,954	174,470	1,331,930	64,552	1,844,082	211,574
LANDED AT PORTLAND.												
June	234	28			57	7						
July	3,591	514			2,634	268			447	50		
August	10,020	1,141			50,071	3,728			21,848	1,581		
September	436,995	32,484			49,193	3,439			32,410	333		
Total	450,840	34,167			101,885	7,442			54,705	1,964		
Grand total	6,518,066	482,402	1,521,600	171,851	3,194,017	244,393	1,772,554	174,740	2,319,734	139,762	2,116,092	239,971
Grounds E. of 66° W. long	1,819,942	97,516	669,900	46,796	380,525	23,166	714,800	51,806				
Grounds W. of 66° W. long	4,698,124	385,886	852,600	125,055	2,813,492	221,227	1,057,754	122,934	2,319,734	139,762	2,116,092	239,971
Landed at Boston in 1916	5,191,392	327,874	20,000	1,350	2,341,095	146,569	47,800	4,161	891,095	42,370	8,600	860
Landed at Gloucester in 1916	344,838	14,518	1,823,066	148,126	880,162	39,357	2,235,131	203,178	429,472	18,339	931,696	63,708
Landed at Portland in 1916	213,873	11,792			217,124	10,953	1,055	108	322,580	15,767	7,370	258

Month	Miscellaneous.[a]				Total.				Grand total.	
	Fresh		Salted		Fresh.		Salted.			
LANDED AT BOSTON.	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
January	143,798	$7,288			6,281,716	$295,859			6,281,716	$295,859
February	120,729	6,108			7,988,595	399,399			7,988,595	399,399
March	205,633	9,709			8,437,987	395,106			8,437,987	395,106
April	539,987	14,233			6,377,065	282,867			6,377,065	282,867
May	797,969	20,386			7,315,727	291,510			7,315,727	291,510
June	1,148,353	32,634			9,458,292	398,269	177,300	$10,767	9,635,592	409,036
July	1,271,808	143,143			8,212,204	494,721	52,600	4,860	8,264,804	499,581
August	1,230,688	128,197			10,451,829	604,825	173,800	18,314	10,625,629	623,139
September	480,964	38,451			9,794,158	567,084	91,810	9,931	9,885,968	577,015
October	307,362	13,019			10,283,110	639,550			10,283,110	639,550
November	219,551	7,071			7,819,104	403,430			7,819,104	403,430
December	148,499	5,587			5,734,842	349,948			5,734,842	349,948
Total	6,615,341	425,826			98,154,629	5,122,568	495,510	43,872	98,650,139	5,166,440
LANDED AT GLOUCESTER										
January			2,848,894	$83,631	2,478,795	79,251	2,868,279	84,409	5,347,074	163,660
February	487,946	15,484	2,493,316	75,922	911,771	49,953	2,502,330	76,307	3,414,101	126,260
March					724,493	53,421	16,875	772	741,368	54,193
April	57,600	1,226			1,643,449	73,284			1,643,449	73,284
May	1,526,610	19,752			4,746,891	152,254	4,031	210	4,750,922	152,464
June	1,285,332	9,974			6,074,160	161,936	2,957,611	170,894	9,031,771	332,830
July					5,029,547	142,908	1,547,862	85,388	6,577,409	228,296
August	17,000	170			7,952,019	244,195	3,202,713	256,351	11,154,732	500,546
September					3,271,272	110,401	1,691,580	170,831	4,962,852	281,232
October					1,809,587	62,028	1,621,960	144,179	3,431,547	206,207
November	30,476	3,662			3,431,897	135,410	675,490	42,840	4,107,387	178,250
December			979,600	52,764	1,988,217	101,309	984,115	52,953	2,972,332	154,262
Total	3,404,964	50,268	6,321,810	212,317	40,062,098	1,366,350	18,072,846	1,085,134	58,134,944	2,451,484

[a] Includes herring from Newfoundland, 487,946 pounds frozen value $15,484, and 6,321,810 pounds salted, value $212,317.

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER MASS., AND PORTLAND, ME., BY AMERICAN FISHING VESSELS DURING THE YEAR 1917, SHOWN BY MONTHS—Continued.

Month.	Miscellaneous.				Total.				Grand total.	
	Fresh.		Salted.		Fresh.		Salted.			
LANDED AT PORTLAND.	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value*
January	63,066	$2,208	.....	.....	851,583	$46,480	1,700	$34	853,283	$46,514
February	65,464	2,201	.....	.....	668,871	37,011	455	10	669,326	37,021
March	108,324	2,599	.....	.....	1,129,615	56,065	5,782	263	1,135,397	56,328
April	34,244	831	.....	.....	1,681,487	67,581	65	2	1,681,552	67,583
May	415,112	4,703	.....	.....	1,384,345	39,019	.....	.....	1,384,345	39,019
June	2,528,282	28,032	.....	.....	3,219,984	52,353	42,395	2,286	3,262,379	54,639
July	136,883	3,188	.....	.....	1,708,450	57,455	27,000	1,448	1,735,450	58,903
August	188,365	12,224	.....	.....	2,146,094	93,953	1,729	87	2,147,823	94,040
September	113,460	7,529	.....	.....	2,128,402	107,427	.....	.....	2,128,402	107,427
October	58,132	2,055	.....	.....	1,962,875	83,094	.....	.....	1,962,875	83,094
November	126,874	4,568	.....	.....	1,021,219	54,637	.....	.....	1,021,219	54,637
December	69,034	2,129	.....	.....	663,452	44,203	.....	.....	663,452	44,203
Total	3,907,240	72,267	.....	.....	18,566,377	739,278	79,126	4,130	18,645,503	743,408
Grand total	13,927,545	548,361	6,321,810	$212,317	156,783,104	7,228,196	18,647,482	1,133,136	175,430,586	8,361,332
Grounds E. of 66° W. long	675,717	26,303	6,321,810	212,317	51,123,977	2,049,783	14,605,809	644,565	65,729,786	2,694,348
Grounds W. of 66° W. long	13,251,828	522,058	.....	.....	105,659,127	5,178,413	4,041,673	488,571	109,700,800	5,666,984
Landed at Boston in 1916	6,712,473	375,230	.....	.....	98,254,638	3,695,994	76,400	6,371	98,331,038	3,702,365
Landed at Gloucester in 1916	7,318,583	160,173	7,223,224	183,344	46,515,277	1,212,013	20,165,271	947,881	66,680,548	2,159,894
Landed at Portland in 1916	6,182,411	71,421	40	2	20,551,394	513,671	261,445	7,976	20,812,839	521,647

The large quantity of fishery products landed at Boston and Gloucester, Mass., and Portland, Me., by American fishing vessels is taken principally from fishing grounds lying off the coast of the United States. In the calendar year 1917, 62.47 per cent of the quantity and 67.72 per cent of the value of the catch landed by the American fishing fleet at these ports were taken from these grounds; 4.91 per cent of the quantity and 3.94 per cent of the value, consisting chiefly of herring, were taken from fishing banks off the coast of Newfoundland; and 32.61 per cent of the quantity and 28.32 per cent of the value were from grounds off the Canadian Provinces. The receipts of Newfoundland herring constituted 3.88 per cent of the quantity and 2.72 per cent of the value of the fishery products landed at these ports during the year. The herring were taken on the treaty coasts of Newfoundland, but cod and other species from that region were obtained chiefly from fishing banks on the high seas. All fish caught by American fishing vessels off the Canadian Provinces were from offshore fishing grounds. The catch from each of these regions is given in detail in the following table:

QUANTITY AND VALUE OF FISH LANDED BY AMERICAN FISHING VESSELS AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., IN 1917 FROM GROUNDS OFF THE COAST OF THE UNITED STATES, NEWFOUNDLAND, AND CANADIAN PROVINCES.

Species.	United States.		Newfoundland.		Canadian Provinces.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Cod:								
Fresh	25,064,491	$1,210,065	584,278	$18,247	24,224,068	$821,040	49,872,837	$2,049,352
Salted	8,846	426	477,160	24,390	6,087,685	296,666	6,573,691	321,482
Haddock:								
Fresh	33,810,941	1,675,131	97,275	4,665	19,486,646	831,995	53,394,742	2,511,787
Salted	140	3	4,885	165	154,948	4,743	160,093	4,984
Hake:								
Fresh	6,673,922	302,371	105,286	2,883	1,060,347	33,770	7,839,555	339,061
Salted	1,729	87	10,645	318	62,717	1,956	75,091	2,361
Pollock:								
Fresh	13,740,878	554,496	5,965	109	720,667	23,447	14,467,510	578,015
Salted	1,012	24	1,522	45	37,748	1,147	40,282	1,216
Dusk:								
Fresh	2,738,876	96,851	23,692	551	762,830	21,033	3,525,398	118,435
Salted	3,500	71	5,815	188	14,590	420	23,905	679
Halibut:								
Fresh	445,753	66,454	474,391	49,331	803,556	99,843	1,723,700	215,628
Salted	----------	----------	12,571	1,366	29,793	2,238	42,364	3,604
Mackerel:								
Fresh	9,831,350	746,875	----------	----------	2,200,467	120,682	12,031,817	867,557
Salted	4,026,446	487,960	----------	----------	1,383,800	98,602	5,410,246	586,562
Herring:								
Fresh	6,319,808	70,736	487,946	15,484	9,000	77	6,816,754	86,297
Salted	----------	----------	6,321,810	212,317	----------	----------	6,321,810	212,317
Swordfish:								
Fresh	1,944,684	288,246	----------	----------	28,834	3,923	1,973,518	292,169
Tilefish:								
Fresh	1,211,450	44,743	----------	----------	----------	----------	1,211,450	44,743
Miscellaneous:								
Fresh	3,775,986	118,333	2,024	41	147,913	6,778	3,925,823	125,152
Total	109,599,712	5,662,872	8,615,265	330,100	57,215,609	2,368,360	175,430,586	8,361,332

Cod.—In 1917 the fishing fleet landing fish at Boston, Gloucester, and Portland was not quite so large as in the previous year. There were 6 vessels employed in the salt bank fishery and 88 in the market fishery, landing their fares of cod and other ground fish at these ports. Large quantities of cod were also landed by vessels fishing on the shore grounds. The total quantity of cod landed during the year was 56,446,528 pounds, valued at $2,370,834, of which 49,872,837

pounds, valued at $2,049,352, were fresh, and 6,573,691 pounds, valued at $321,482, were salted.

Haddock.—The catch of haddock during the year was smaller than that of cod in quantity, but greater in value. There was a decrease in the catch as compared with the previous year of 7,000,957 pounds, or 11.56 per cent, in quantity, but an increase of $755,027, or 42.85 per cent, in the value. The total quantity landed during the year was 53,554,835 pounds, valued at $2,516,702, all of which were fresh except 160,093 pounds, salted, valued at $4,915.

Hake.—The yield of hake for the year was 7,914,646 pounds, valued at $341,385, all landed fresh except 75,091 pounds, salted, valued at $2,361. The catch declined 5,257,653 pounds, or 39.91 per cent, in quantity, but showed an increased of a little more than 1 per cent in value.

Pollock.—The pollock catch was nearly twice as large as that of hake, the quantity landed amounting to 14,507,792 pounds, valued at $579,268. This product was all fresh, with the exception of 40,282 pounds, salted, valued at $1,216. The catch was about 7 per cent less than that of the previous year in quantity, but increased 51 per cent in value.

Cusk.—The catch of cusk was 3,549,303 pounds, valued at $119,114, of which 23,905 pounds, valued at $679, were salted. There was a decrease of 41.51 per cent in the quantity of cusk landed, but the value was only slightly less than that of the previous year.

Halibut.—The yield of halibut was 1,766,064 pounds, valued at $219,232. This quantity included 42,364 pounds of salted halibut, valued at $3,604. There was a decline in the output of halibut, as compared with the previous year of 48.93 per cent in quantity and 43.14 per cent in value.

Mackerel.—The total catch of fresh mackerel taken by the American fishing fleet in 1917 amounted to 111,932 barrels, compared with 102,420 barrels the previous year, an increase of 9,512 barrels. The output of salted mackerel was 32,162 barrels, as compared with 32,066 barrels the previous year, an increase of 96 barrels. The quantity of mackerel landed at Boston, Gloucester, and Portland during the year was 17,442,063 pounds, valued at $1,454,119, of which 12,031,817 pounds, valued at $867,557, were fresh, and 5,410,246 pounds, valued at $586,562, were salted.

In 1918, up to June 30, the catch of fresh mackerel amounted to 27,992 barrels and of salted mackerel to 7,937 barrels, as compared with 38,947 barrels fresh and 7,131 barrels salted the previous year. The southern mackerel fleet numbered about 35 sail of seiners and 125 sail of netters. The seiners had a light catch, and reported considerable quantities of mackerel, but that they were wild, chasing live feed, and therefore hard to catch. They did not school much at night, but only during the day. The first seiner arrived at New York on May 6 with 13,000 large and medium mackerel, which were sold at 18 to 20 cents per pound. These fish were taken in 34 fathoms of water. The netters did not land as many mackerel as the previous year, but, owing to the higher prices received, they did well financially. The mackerel landed by the southern fleet this year were all large and medium fish and sold at 13 to 20 cents per pound,

according to market conditions. The Cape Shore fleet numbered 38 sail of vessels, being a little larger than the previous year. No vessel made more than one trip. A large body of fish was reported and all the vessels returned with good catches. The catch taken on the Cape Shore amounted to 1,689,000 pounds of fresh mackerel, and 7,558 barrels salted, compared with 2,229,900 pounds of fresh and 7,131 barrels salted the previous year. The first arrival from the Cape Shore was on June 8, and consisted of 50,000 large and medium fresh mackerel, which sold at 10½ cents per pound. One schooner, on her Cape Shore mackerel trip, obtained 95,000 pounds fresh and 375 barrels of salted mackerel, and stocked $15,665, the crew sharing $343 each. This is said to be the largest stock ever made on a single mackerel trip.

Swordfish.—The catch of swordfish landed at Boston, Gloucester, and Portland during the year amounted to 1,973,518 pounds, valued at $292,169. The number of vessels engaged in this fishery was 42, or 9 more than in the previous year.

Flounders.—The catch of flounders in the vessel fisheries amounted to 1,279,721 pounds, valued at $44,936. The catch taken by vessels under 5 tons net tonnage is not included in these statistics. These fish are taken chiefly with the flounder drag, an apparatus similar to an otter trawl, and adapted for use in this fishery. This apparatus is used by power vessels and boats. It varies in size according to the size of the vessel or boat using it. The foot line or chain varies in the different sizes of nets from about 48 to 70 feet in length. When being set the drag is thrown overboard from the stern of the boat, and the foot line, or chain, carries it quickly to the bottom. In the meantime the boat is under power, and when the water strikes the drag the bag or net is opened. As the boat moves forward two otter boards, or wooden doors, one at each end of the foot line, or chain, operate to spread the bag out to its full extent. The apparatus is drawn along the bottom by the vessel or boat for about two hours, and then it is taken on board and the fish are dumped out.

The Massachusetts fishermen have been catching during the past year, apparently for the first time in commercial quantities, a fish which is locally called sole or gray sole. This species, which has been identified as the pole flounder, craig flounder, or deep-sea flounder (*Glyptocephalus cynoglossus*), is found on both shores of the Atlantic Ocean, ranging as far south as Ireland and Delaware Bay in deep water. It was first found on our coast in 1877, when numerous specimens were secured by the Bureau in the deepest parts of Massachusetts Bay. It is an excellent food fish, and large quantities were taken in the fall of 1917 and also during the year 1918.

VESSEL FISHERIES AT SEATTLE, WASH.

The vessel fisheries at Seattle, Wash., have not varied materially in extent from the previous year. The products landed by fishing vessels have been smaller in quantity, but have increased in value. In the products landed by collecting vessels there has been considerable increase in both quantity and value. Statistics of the vessel fisheries at Seattle have been collected by the local agent and pub-

lished as monthly and annual statistical bulletins, giving the quantity of fishery products landed by American fishing vessels at that port.

In 1917 the fishing fleet at Seattle landed at that port 620 trips, aggregating 16,553,944 pounds of fish, having a value to the fishermen of $1,738,802. This catch was taken from the various fishing grounds along the coast from off the Columbia River northward to Portlock Bank, Alaska. The localities from which the largest quantities of fish were taken were the Destruction Island Grounds, Flattery Banks, Hecate Strait, Yakutat Grounds, and Portlock Bank. The products included halibut, 13,949,683 pounds, valued at $1,625,409; sablefish or black cod, 2,430,105 pounds, valued at $107,350; and other species amounting to 174,156 pounds, valued at $6,043.

The fishery products taken in Puget Sound and landed at Seattle by collecting vessels during the year amounted to 12,821,353 pounds, valued at $988,559. The products included salmon, 10,869,193 pounds, valued at $935,915; steelhead trout, 165,024 pounds, valued at $16,233; herring, 1,211,224 pounds, valued at $6,393; smelt, 211,799 pounds, valued at $13,004; and other fishery products amounting to 364,113 pounds, valued at $17,014. These products included 3,909 pounds of whale meat, valued at $195.

Compared with the previous year there was an increase of 103 trips by fishing vessels, with a decrease of 857,491 pounds, or 4.92 per cent, in the quantity, and an increase of $377,569, or 27.73 per cent, in the value of the products landed. In the products landed by collecting vessels there was an increase of 2,683,966 pounds, or 26.47 per cent, in the quantity, and of $517,300, or 109.76 per cent, in the value. The quantity and value of fishery products landed at Seattle by fishing and collecting vessels in 1917 are given in detail in the following table:

Quantities and Values of Certain Fresh Fishery Products Landed at Seattle, Wash., by American Fishing Vessels During the Calendar Year 1917.

BY FISHING GROUNDS.

	Number of trips.	Halibut.		Cod.		Sablefish (black cod).		"Lingcod."		Red rockfish.		Herring.		Total.	
		Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Columbia River grounds	25	605,000	$64,283			267,500	$10,900							872,500	$75,183
Grays Harbor grounds	7	90,500	14,516			149,500	6,435							240,000	20,951
Destruction Island grounds	32	661,000	65,761			413,000	16,520							1,074,000	82,281
Flattery Banks	246	2,099,400	228,595			873,700	42,281	23,000	$460					2,996,100	271,336
West coast, Vancouver Island	65	610,900	90,992			301,400	14,422	60,000	2,400	5,000	$191	8,000	$1,260	985,300	109,265
Cape Scott grounds	38	590,000	59,173			4,000	160			1,000	30			595,000	59,363
Hecate Strait	83	2,254,600	307,056			176,000	7,180							2,430,600	314,236
Noyes Island	7	72,000	7,043											72,000	7,043
Coronation Island	28	806,200	80,176			13,870	402							820,070	80,578
Cape Spencer	3	130,000	13,480											130,000	13,480
Yakutat grounds	44	3,153,158	346,528			118,540	3,676	274	6	24,132	631			3,296,104	350,841
Yakataga grounds	2	100,000	18,000											100,000	18,000
Cape Cleare grounds	1	34,725	4,176			1,000	50							35,725	4,226
Portlock Bank	39	2,742,200	325,630	15,000	$226	111,595	5,324	8,500	253	29,250	586			2,906,545	332,019
Total	620	13,949,683	1,625,409	15,000	226	2,430,105	107,350	91,774	3,119	59,382	1,438	8,000	1,260	16,553,944	1,738,802

BY MONTHS.

January	13	751,702	$87,978			73,870	$1,825							825,572	$89,803
February	7	296,548	35,484			19,720	565	184	$4	3,266	$93			319,718	36,146
March	44	1,533,330	136,389			63,690	2,304			5,566	168			1,602,586	138,861
April	85	1,327,200	140,940			60,300	2,362			2,200	66			1,389,700	143,368
May	146	2,540,500	237,965			320,400	12,801			10,250	205			2,871,150	250,971
June	114	2,008,600	204,449			496,000	19,840	23,000	460					2,527,600	224,749
July	34	1,082,000	120,582	15,000	$226	270,000	10,800	150	3	13,600	273			1,380,750	131,884
August	40	1,163,800	158,826			206,500	8,260							1,370,300	167,086
September	37	1,056,600	146,223			380,000	15,905			6,400	133			1,443,000	162,261
October	46	1,014,700	162,482			376,695	23,495					8,000	$1,260	1,399,395	187,237
November	27	343,403	62,910			96,880	6,095	90	2	11,100	248			451,473	69,255
December	27	831,300	131,181			66,050	3,098	68,350	2,650	7,000	252			972,700	137,181
Total	620	13,949,683	1,625,409	15,000	226	2,430,105	107,350	91,774	3,119	59,382	1,438	8,000	1,260	16,553,944	1,738,802

FISHERY PRODUCTS, BY MONTHS, TAKEN IN PUGET SOUND AND LANDED AT SEATTLE, WASH., BY COLLECTING VESSELS DURING 1917.

Species.	January.		February.		March.		April.		May.		June.		July.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Crayfish					220	$11			2,205	$138	3,100	$155	1,060	$63
Sturgeon	2,000	$30	359,324	$1,797	739,950	3,700			109,950	866				
Herring									7,600	380				
Shad														
Salmon:														
Humpback or pink													23,850	477
Chum or keta	2,860	157											9,120	273
King or spring	200	22	318	27	132	7	8,400	$773	229,565	17,772	326,130	24,460	497,165	34,801
Coho or silver	50	3	50	2							67,190	5,375	34,000	2,040
Sockeye or red									1,900	150	19,280	1,345	41,830	3,346
Trout:														
Steelhead	24,687	2,716	25,330	2,723					14,350	1,135	24,000	1,920	11,650	699
Salmon			5,504	660	5,692	710	7,388	637	20,208	1,056	17,000	1,360		
Smelt	3,000	90	2,000	100	3,205	128	4,200	210			2,400	134		
Perch			97	1					2,500	25				
Red rockfish	650	33	2,500	270	2,141	112							3,620	92
"Lingcod"	1,000	30	1,021	41	3,514	131	1,500	28	18,000	270	6,000	150	3,520	63
Cod			12,000	270	10,236	505								
Flounders	1,425	21	2,350	35	2,600	39	500	8	4,700	71	6,400	128	960	14
Sole	3,075	85	9,040	249	9,051	272	2,500	63	2,200	38	8,000	320		
Other fish													3,065	92
Whale meat									3,909	195				
Crabs	6,324	287	4,100	238	2,000	100	1,320	150	2,076	400				
Clams					12,900	129	4,000	50	3,105	34				
Total	45,271	3,474	423,634	6,413	791,631	5,844	29,808	1,919	422,268	22,530	479,500	35,347	629,840	41,960

Species.	August.		September.		October.		November.		December.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Grayfish	1,000	$10									1,000	$10
Sturgeon	2,000	80	2,200	$132	395	$20					11,180	599
Herring											1,211,224	6,393
Shad											7,600	380
Salmon:												
Humpback or pink	1,090,530	29,354	386,700	38,670	1,791	179					1,502,871	68,680
Chum or keta	120,636	6,032	448,890	22,445	3,795,630	379,563	870,490	$56,869	158,790	$16,466	5,406,416	481,805
King or spring	427,100	25,626	137,060	12,335	51,455	4,631	15,840	1,584	20,434	2,043	1,713,799	124,081
Coho or silver	123,335	2,745	395,856	39,586	976,808	146,521	64,260	8,158	2,340	234	1,663,889	204,664
Sockeye or red	223,890	22,389	287,630	28,763	7,688	692					582,218	56,685
Trout:												
Steelhead	1,730	190	21,880	2,188	9,944	895	233	21	31,220	3,746	165,024	16,233
Salmon											55,782	4,423
Smelt			10,000	800	60,114	4,809	87,820	4,390	39,060	2,343	211,799	13,004
Perch			4,000	80			450	18			7,047	124
Red rockfish			520	10	135	4					9,566	521
"Lingcod"	1,500	15	1,265	25							37,320	753
Cod											22,236	775
Flounders	700	7	3,100	62							22,735	385
Sole			2,000	80			2,246	44	3,060	124	41,172	1,275
Other fish	4,400	308	1,464	59					44,000	1,320	52,929	1,779
Whale meat											3,909	195
Crabs							26,662	2,430	29,150	1,977	[a] 71,632	5,582
Clams											20,005	213
Total	1,996,821	86,756	1,702,565	145,235	4,903,960	537,314	1,068,001	73,514	328,054	28,253	12,821,353	988,559

[a] 3,965 dozen.

COASTAL FISHERIES OF NEW YORK AND NEW JERSEY.

A statistical canvass of the coastal fisheries of New York and New Jersey was made during the year for the calendar year 1917 similar to the previous canvass of these fisheries for the year 1915. The statistics included only fishes proper.

In New York there were 1,538 persons engaged in the coastal fisheries, exclusive of shellfish, in 1917; the investment in vessels, boats, fishing apparatus, and shore and accessory property was $1,370,823; and the products amounted to 68,315,888 pounds, valued at $1,376,360. The principal species taken were alewives, 788,875 pounds, valued at $14,617; bluefish, 961,340 pounds, valued at $183,136; butterfish, 800,499 pounds, valued at $47,979; flounders, 4,176,374 pounds, valued at $180,333; menhaden, 50,441,540 pounds, valued at $261,919; scup or porgy, 1,212,650 pounds, valued at $72,217; sea bass, 1,122,623 pounds, valued at $81,654; squeteague or weakfish, 2,292,050 pounds, valued at $170,861; tilefish, 1,480,828 pounds, valued at $100,551; and whiting, 1,488,800 pounds, valued at $33,510. The menhaden were caught chiefly in southern waters and landed at southern ports, but are properly credited to New York because taken by vessels belonging in that State.

Compared with the returns for 1915, there was a decrease of 966, or 38.5 per cent, in the number of persons engaged, and of $400,343, or 22.6 per cent, in the amount of capital invested; but an increase of 34,268,113 pounds, or 100.6 per cent, in the quantity, and of $254,719, or 22.7 per cent, in the value of the products. If the menhaden are excluded for both years, a decrease is shown in the quantity of all other fish of 1,654,615 pounds, or 8.4 per cent, and an increase in the value of $93,735, or 9.18 per cent.

In New Jersey in 1917 there were 2,137 persons engaged in the coastal fisheries for fishes proper; the investment in vessels, boats, fishing apparatus, and shore and accessory property was $1,235,550; and the products amounted to 49,979,375 pounds, valued at $1,953,076. The species taken in largest quantities were alewives, 2,051,172 pounds, valued at $28,746; bluefish, 1,122,158 pounds, valued at $150,605; butterfish, 4,227,745 pounds, valued at $200,564; croaker, 3,483,095 pounds, valued at $142,811; flounders, 1,369,848 pounds, valued at $85,643; hake, 2,092,195 pounds, valued at $27,338; menhaden, 1,433,984 pounds, valued at $14,664; scup or porgy, 3,673,173 pounds, valued at $137,004; sea bass, 5,323,116 pounds, valued at $313,137; squeteague or weakfish, 11,004,255 pounds, valued at $482,916; and whiting, 10,401,255 pounds, valued at $135,188.

Compared with 1915 there was a decrease of 166, or 7.2 per cent, in the number of persons engaged; an increase of $43,493, or 3.6 per cent, in the investment; of 2,123,199 pounds, or 4.4 per cent, in the quantity; and $604,409, or 44.8 per cent, in the value of the products. Excluding the menhaden for both years, there was an increase in 1917 in the quantity of all other fish of 5,044,004 pounds, or 11.59 per cent, and in the value of $626,347, or 47.73 per cent.

The statistics of these fisheries, by counties, are given in the following table:

Coastal Fisheries of New York and New Jersey, by Counties, Exclusive of Shellfish, 1917.

Items.	New York.[a]								New Jersey.			
	Nassau.		New York and Richmond.		Suffolk.		Total.		Atlantic.		Burlington.	
	Number.	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*
Persons engaged	74		650		814		1,538		292		36	
Vessels fishing	2	$2,500	41	$497,460	60	$87,430	103	$587,390	19	$66,200		
Tonnage	15		2,171		563		2,749		301			
Outfit		290		230,706		19,675		250,671		40,125		
Vessels transporting	2	2,000			29	56,950	31	58,950				
Tonnage	17				322		339					
Outfit		90				5,516		5,606				
Sail, row, and house-boats	16	560			410	16,548	426	17,108	47	1,140	21	$350
Gasoline boats	18	7,950	1	800	232	104,000	251	112,750	27	10,650	5	400
Pound nets	1	4,000	1	800	485	141,265	487	146,065	1	1,500		
Seines	7	610	31	34,200	95	13,176	133	47,986	35	7,330	5	325
Gill nets	181	4,390	160	2,100	589	15,930	930	22,420	71	10,125	23	360
Fyke nets					4,053	22,482	4,053	22,482	6	240		
Bag nets									24	680	59	1,535
Dip nets					5	25	5	25				
Lines		420		7,250		756		8,426		3,190		
Otter trawls	3	90			225	6,865	228	6,955	1	120		
Eel pots	232	282			4,503	4,923	4,735	5,205	85	155		
Other apparatus		[b] 2,939				70		3,009		2		
Shore and accessory property		1,450				74,325		75,775		7,910		250
Total		27,571		773,316		569,936		1,370,823		149,367		3,220
PRODUCTS.	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Albacore and horse mackerel	6,500	$250	801	$38	3,550	$185	10,851	$473				
Alewives	10,800	424	5,000	150	773,075	14,043	788,875	14,617	13,578	$570		
Bluefish	8,800	1,990	869,511	165,011	83,029	16,135	961,340	183,136	251,830	32,325		
Bonito	2,050	260	8,057	1,287	67,094	8,021	77,201	9,568	700	55		
Butterfish	22,050	1,254			778,449	46,725	800,499	47,979	6,175	447		
Carp					122,600	15,234	122,600	15,234				
Cod	4,000	400	306,930	23,267	43,906	4,299	354,836	27,966	47,000	3,835		
Croaker			7,025	281			7,025	281	442,878	17,188		
Drum									550	22		
Eels, fresh	26,000	2,825	6,248	326	383,359	42,342	415,607	45,493	13,865	1,006		
Flounders	68,540	3,261	4,935	489	4,102,899	176,583	4,176,374	180,333	58,907	3,827	875	$75
Grayfish	2,420	70	3,500	105	35,315	818	41,235	993	4,600	85		
Haddock			24,775	2,135			24,775	2,135				

[a] No fisheries were operated in Kings and Queens counties in 1917.

[b] Includes 1,950 sea-bass pots, valued at $2,925.

COASTAL FISHERIES OF NEW YORK AND NEW JERSEY, BY COUNTIES, EXCLUSIVE OF SHELLFISH, 1917—Continued.

Items.	New York.								New Jersey.			
	Nassau.		New York and Richmond.		Suffolk.		Total.		Atlantic.		Burlington.	
PRODUCTS—continued.	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Hake	6,520	$266	16,997	$610	46,075	$1,108	69,592	$1,984	4,600	$290	.....	.....
Herring	.....	.....	.....	.....	291,700	8,143	291,700	8,143	.....	.....	.....	.....
Kingfish	200	50	.....	.....	23,912	5,690	24,112	5,740	6,480	736	.....	.....
Mackerel	35,320	4,310	25,500	3,150	501,225	36,366	562,045	43,826	261,250	29,550	.....	.....
Menhaden	1,200	25	45,304,800	220,440	5,135,540	41,454	50,441,540	261,919	9,700	225	.....	.....
Mullet, fresh	.....	.....	.....	.....	250	13	250	13	.....	.....	.....	.....
Mummichog	.....	.....	.....	.....	221,100	2,015	221,100	2,015	.....	.....	.....	.....
Pike	.....	.....	.....	.....	.....	.....	.....	.....	650	50	.....	.....
Pollock	.....	.....	168,776	8,469	110,675	6,256	279,451	14,725	.....	.....	.....	.....
Scup or porgy	2,550	223	662,438	42,080	547,662	29,914	1,212,650	72,217	672,250	22,513	.....	.....
Sea bass	160,800	9,664	396,339	28,868	565,484	43,122	1,122,623	81,654	767,100	41,505	.....	.....
Sea robins	3,500	70	150	5	97,650	2,141	101,300	2,216	.....	.....	.....	.....
Shad	.....	.....	2,160	306	12,987	2,296	15,147	2,602	.....	.....	.....	.....
Sharks	1,540	30	260	10	18,437	423	20,237	463	14,500	160	.....	.....
Skates and rays	880	17	5,438	191	177,750	2,088	184,068	2,296	11,000	170	.....	.....
Smelt	900	225	.....	.....	16,662	3,948	17,562	4,173	.....	.....	.....	.....
Spanish mackerel	100	20	.....	.....	388	70	488	90	.....	.....	.....	.....
Spot	550	33	.....	.....	787	66	1,337	99	1,600	94	.....	.....
Squeteague or weakfish	38,780	3,353	470,000	27,000	1,783,270	140,508	2,292,050	170,861	1,275,412	48,397	9,000	$450
Squid	6,160	185	.....	.....	399,500	10,988	405,660	11,173	400	8	.....	.....
Striped bass	5,200	1,815	.....	.....	19,237	4,918	24,437	6,733	6,622	1,116	880	250
Sturgeon	220	35	.....	.....	17,524	3,400	17,744	3,435	.....	.....	.....	.....
Sturgeon caviar	.....	.....	.....	.....	175	437	175	437	.....	.....	.....	.....
Suckers	.....	.....	.....	.....	.....	.....	.....	.....	3,175	189	.....	.....
Swordfish	.....	.....	.....	.....	2,000	240	2,000	240	.....	.....	.....	.....
Tautog	220	18	.....	.....	118,812	8,686	119,032	8,704	.....	.....	.....	.....
Tilefish	.....	.....	1,480,828	100,551	.....	.....	1,480,828	100,551	257,000	17,200	.....	.....
Tomcod	.....	.....	.....	.....	20,287	1,314	20,287	1,314	.....	.....	.....	.....
Whitebait	.....	.....	.....	.....	99,700	4,937	99,700	4,937	.....	.....	.....	.....
White perch	.....	.....	.....	.....	17,175	1,919	17,175	1,919	18,449	2,042	16,510	2,405
Whiting	89,800	2,245	.....	.....	1,309,000	31,265	1,488,800	33,510	1,710	14	.....	.....
Yellow perch	.....	.....	.....	.....	.....	.....	.....	.....	650	50	.....	.....
Other fish	.....	.....	.....	.....	1,580	163	1,580	163	6,365	385	540	41
Total	505,600	33,318	49,770,468	624,769	18,039,820	718,273	68,315,888	1,376,360	4,158,996	224,054	27,805	3,221

COASTAL FISHERIES OF NEW YORK AND NEW JERSEY, BY COUNTIES, EXCLUSIVE OF SHELLFISH, 1917—Continued.

Items.	New Jersey.											
	Cape May.		Hudson.		Middlesex.		Monmouth.		Ocean.		Total.	
	Number.	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*
Persons engaged	660		10		28		507		600		2,137	
Vessels fishing	22	$58,200	2	$2,000			2	$4,500			45	$130,900
Tonnage	292		11				23				627	
Outfit		38,925		625				1,500				81,175
Vessels transporting							2	5,500			2	5,500
Tonnage							24				24	
Outfit								2,050				2,050
Sail, row, and house boats	34	600	5	85	7	$135	45	1,065	191	$7,680	350	11,055
Gasoline boats	149	86,825	4	700	3	1,250	169	75,525	163	54,625	490	229,975
Pound nets	64	104,750					55	90,961	42	91,771	162	288,982
Seines	18	5,190			7	2,050	3	900	56	5,440	124	21,235
Gill nets	347	23,641					158	11,690	1,971	12,258	2,570	58,074
Fyke nets	41	1,860	14	575	2	60	187	2,144	888	8,670	1,138	13,549
Bag nets											83	2,215
Lines		5,115		40				2,155		1,395		11,895
Otter trawls											1	120
Eel pots			130	190	71	70	1,156	1,400	4,084	4,758	5,526	6,573
Other apparatus		3								37		42
Shore and accessory property		149,815		225		150		110,500		103,360		372,210
Total		474,924		4,440		3,715		309,890		289,994		1,235,550
PRODUCTS.	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Albacore and horse mackerel	5,035	$344					17,890	$1,375	18,100	$989	41,025	$2,708
Alewives	119,870	1,677			450	$25	259,695	2,836	1,657,579	23,638	2,051,172	28,746
Bluefish	347,829	41,492	5,400	$650	4,725	365	369,293	60,189	143,081	15,584	1,122,158	150,605
Bonito	8,613	623					30,407	3,791	104,632	12,153	144,352	16,622
Butterfish	1,802,599	86,384					553,412	25,268	1,865,559	88,465	4,227,745	200,564
Carp					1,050	155					1,050	155
Cod	28,935	2,037	1,400	162			2,504	216	1,400	100	81,239	6,350
Croaker	1,607,639	66,144	900	75	400	15	600,160	29,260	831,118	39,129	3,483,095	142,811
Drum	10,565	276					10,615	235	66,580	902	88,310	1,435
Eels, fresh	23,300	2,542	30,038	2,794	4,450	540	100,965	8,933	218,200	16,935	390,818	32,750
Eels, smoked			1,125	340							1,125	340
Flounders	389,673	21,485			5,300	350	333,027	20,098	582,066	39,808	1,369,848	85,643
Goosefish							43,900	266			43,900	266
Grayfish	750	6					40,572	358	4,000	67	49,922	516
Hake	158,530	2,166					1,110,847	13,751	818,218	11,131	2,092,195	27,338

COASTAL FISHERIES OF NEW YORK AND NEW JERSEY, BY COUNTIES, EXCLUSIVE OF SHELLFISH, 1917—Continued.

Items.	New Jersey.											
	Cape May.		Hudson.		Middlesex.		Monmouth.		Ocean.		Total.	
PRODUCTS—continued.	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Herring							27,485	$322			27,485	$322
Hickory shad							8,787	372			8,787	372
Kingfish	10,208	$1,213					3,849	381	4,100	$467	24,637	2,797
Mackerel	210,055	24,436					51,895	6,212	54,147	6,545	577,347	66,733
Menhaden	200,997	2,436			30,000	$50	987,296	10,076	205,991	1,877	1,433,984	14,664
Mullet, fresh	5,050	281									5,050	281
Mullet, salted	5,600	402									5,600	402
Pike											650	50
Pollock	33,250	315					1,676	64	5,685	108	40,611	517
Round herring							92,277	3,612			92,277	3,612
Scup or porgy	2,583,198	95,710	450	$50			91,918	4,612	325,357	14,119	3,673,173	137,004
Sea bass	3,583,112	199,958	2,200	320			173,996	13,525	796,708	57,829	5,323,116	313,137
Sea robins	2,850	21					31,639	482	8,800	102	43,289	605
Shad	1,100	191					11,794	2,538	1,388	292	14,282	3,021
Sharks	21,450	394					38,225	602	32,509	550	106,684	1,706
Silverside							1,326	25			1,326	25
Skates and rays	19,375	317					207,216	1,803	49,100	595	286,691	2,885
Smelt					7,100	2,050					7,100	2,050
Spanish mackerel	1,685	234					458	70	4,950	768	7,093	1,072
Spot	12,715	598					140,298	3,613	134,709	2,365	289,322	6,670
Squeteague or weakfish	4,476,717	167,602	650	75	89,700	4,650	2,119,538	126,445	3,033,238	135,297	11,004,255	482,916
Squid	57,776	1,340					185,950	3,512	447,084	7,177	691,210	12,037
Striped bass							1,475	260	2,645	655	11,622	2,281
Sturgeon	4,005	650					4,180	486	900	112	9,085	1,248
Sturgeon caviar	285	770					57	111	50	100	392	981
Suckers											3,175	189
Swellfish							10,125	58			10,125	58
Tautog	150	6	2,200	320			44,418	3,009	10,000	900	56,768	4,235
Tilefish											257,000	17,200
Tomcod			1,050	60	600	50	485	45			2,135	155
Whitebait							1,300	40			1,300	40
White perch	3,075	278					460	40	327,205	36,443	365,699	41,208
Whiting	327,384	5,358					5,157,783	61,716	4,914,378	68,100	10,401,255	135,188
Yellow perch	1,300	70									1,950	120
Other fish							41	20			6,946	446
Total	16,064,675	727,776	45,413	4,846	143,775	8,250	12,869,234	410,627	16,669,477	547,302	49,979,375	1,953,076

FISHING ON FIVE-FATHOM BANK, NEW JERSEY, IN 1916 AND 1917.

For several years a considerable number of pound nets have been set on Five-Fathom Bank, lying about 10 miles off the coast of southern New Jersey. The Bureau has collected statistics of this fishery for 1916 and 1917. The information for 1917 is included in the foregoing statistics of the coastal fisheries of New Jersey for that year.

In 1916 there were 120 persons engaged in fishing pound nets on Five-Fathom Bank. The number of pound nets operated was 14, valued at $44,550; the number of boats used was 19, valued at $18,625; and the shore and accessory property was valued at $78,400; a total investment of $141,575. The products amounted to 3,224,140 pounds, valued at $133,612.

In 1917 there were 183 persons engaged in the fishery; the number of pound nets fished was 21, valued at $72,322; the boats numbered 27, valued at $25,900; and the shore and accessory property was valued at $104,250; a total investment of $202,472. The products aggregated 4,828,620 pounds, valued at $231,695.

The principal species of fish taken in each of these years were scup or porgy, sea bass, and squeteague or weakfish. Butterfish, croaker, flounders, mackerel, and various other species were also taken in considerable quantities.

Statistics of this fishery in 1916 and 1917 are given in the following table:

FISHING ON FIVE-FATHOM BANK, N. J., IN 1916 AND 1917.

Items.	1916		1917	
	Number.	*Value.*	*Number.*	*Value.*
Fishermen	98	.....	149	.....
Shoresmen	22	.....	34	.....
Pound nets	14	$44,550	21	$72,322
Gasoline boats	18	18,600	25	25,850
Other boats	1	25	2	50
Shore and accessory property	.....	78,400	.....	104,250
Total investment	.....	141,575	.....	202,472
PRODUCTS.	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Butterfish	52,420	$2,380	219,621	$10,533
Croaker	72,460	2,202	200,512	7,882
Flounders	25,760	1,024	93,052	4,460
Mackerel	2,700	270	8,800	880
Scup or porgy	905,480	32,617	1,080,200	45,163
Sea bass	1,432,435	61,735	2,041,460	112,499
Squeteague or weakfish	618,040	30,193	1,034,960	46,211
Whiting	2,260	30	28,426	425
Other fish	66,295	2,320	79,005	2,800
Squid	46,290	841	42,584	842
Total	3,224,140	133,612	4,828,620	231,695

SHAD FISHERY OF THE HUDSON RIVER.

In connection with the canvass of the coastal fisheries of New York and New Jersey, statistics were obtained of the shad fishery of the Hudson River for the years 1917 and 1918. In 1918 there were 227 fishermen engaged in this fishery, using 125 boats, valued at $4,790; 273 gill nets, valued at $10,756; 15 seines, valued at $1,370; and shore and accessory property valued at $3,191; a total investment of $20,107. The catch of shad was much larger than in any of the three preceding years, amounting to 67,403 in number, or 234,602 pounds, valued at $48,184. Of this quantity 63,404 shad, or 220,602 pounds, valued at $44,784, were taken on the New York side of the river, and 3,999 shad, or 14,000 pounds, valued at $3,400, were taken on the New Jersey side. In 1915 the total catch of shad in this river in both States was 15,855 fish, or 68,668 pounds, valued at $8,643; in 1916, 9,287 fish, or 40,173 pounds, valued at $5,465; and in 1917, 12,015 fish, or 43,384 pounds, valued at $6,540. The catch each year was taken chiefly with gill nets.

SHAD FISHERY OF THE HUDSON RIVER, 1917 AND 1918.[a]

1917

Items.	New York.			New Jersey.			Total.		
	Number.	*Pounds.*	*Value.*	*Number.*	*Pounds.*	*Value.*	*Number.*	*Pounds.*	*Value.*
Fishermen	141	.....	.....	8	.....	.....	149	.....	.....
Rowboats	70	.....	$2,940	4	.....	$130	74	.....	$3,070
Gasoline	1	.....	200	1	.....	300	2	.....	500
Gill nets	213	.....	6,500	2	.....	700	215	.....	7,200
Seines	13	.....	1,135	.....	.....	.....	13	.....	1,135
Shore and accessory property	.....	.....	1,340	.....	.....	1,350	.....	.....	2,690
Total	.....	.....	12,115	.....	.....	2,480	.....	.....	14,595
Shad caught:									
With gill nets	9,535	34,420	5,225	1,400	5,040	720	10,935	39,460	5,955
With seines	1,080	3,924	585	.....	.....	.....	1,080	3,924	585
Total	10,615	38,344	5,810	1,400	5,040	720	12,015	43,384	6,540

1918

Fishermen	224	.....	.....	3	.....	.....	227	.....	.....
Rowboats	122	.....	$4,240	1	.....	$100	123	.....	$4,340
Gasoline	1	.....	250	1	.....	200	2	.....	450
Gill nets	272	.....	10,456	1	.....	300	273	.....	10,756
Seines	15	.....	1,370	.....	.....	.....	15	.....	1,370
Shore and accessory property	.....	.....	2,241	.....	.....	950	.....	.....	3,191
Total	.....	.....	18,557	.....	.....	1,550	.....	.....	20,107
Shad caught:									
With gill nets	61,583	214,196	43,413	3,999	14,000	3,400	65,582	228,196	46,813
With seines	1,821	6,406	1,371	.....	.....	.....	1,821	6,406	1,371
Total	63,404	220,602	44,784	3,999	14,000	3,400	67,403	234,602	48,184

[a] Includes Columbia, Dutchess, Greene, Orange, Rockland, Ulster, and Westchester Counties in New York; and Bergen and Hudson Counties in 1917, and Bergen County in 1918, in New Jersey.

STATISTICS OF THE WHOLESALE FRESH-FISH TRADE OF NEW YORK CITY.

Beginning with September 1, 1917, the Bureau undertook the collection of statistics showing by species the quantities and value of fresh fish handled by the wholesale trade of New York City. This was initiated as an experiment to determine the practicability of carrying on this work continuously as at Boston and Gloucester, Mass., Portland, Me., and Seattle, Wash., and the value of the information to the trade. Statistics were collected for the five months ending January 31, 1918. This afforded ample opportunity for a careful study of the local conditions. The complex nature of shipments received by the wholesale trade made it exceedingly difficult for the dealers to furnish complete returns, and entailed a considerable burden on their clerical force. For these reasons and because of the apathetic attitude of the trade toward the work, the Bureau decided to discontinue the collection of these statistics for the time being.

Statistics of the wholesale fresh-fish trade of New York City from September, 1917, to January, 1918, inclusive, are given in the following table:

FRESH FISH HANDLED BY THE WHOLESALE FISH TRADE OF NEW YORK CITY FROM SEPTEMBER, 1917, TO JANUARY, 1918.

Species.	September.		October.		November.		December.		January.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Albacore or horse mackerel	15,884	$1,312	6,053	$561	9,714	$619	89	$8	385	$29
Amberfish							2,800	250		
Anchovies	350	11			2,150	52	369	18		
Angelfish or spadefish	1,903	126	492	35	100	12			202	25
Barracuda							102	5		
Bluefish	193,960	47,716	354,238	73,424	27,320	8,481	32,037	10,321	194,511	47,291
Blue runner					1,875	80	930	71		
Bonito	37,978	5,868	8,529	1,376						
Bowfin	50,003	3,508	66,288	4,296	80,416	5,259	33,588	2,738	31,444	3,086
Buffalofish	70,959	9,065	95,676	11,480	254,239	31,464	202,297	30,915	311,578	54,860
Butterfish	277,871	31,339	241,672	30,051	34,947	6,547	1,265	313	78,427	8,595
Carp	1,191,584	135,021	967,584	99,454	877,585	91,234	674,538	74,496	478,718	73,042
Catfish and bullheads	11,355	1,304	4,718	610	9,079	1,472	175,524	28,818	1,405	203
Cero			709	105	11,889	2,047	100,199	15,698	188,263	28,659
Channel bass					241	12	271	18	4,894	385
Cisco or lake herring	1,244,905	130,672	1,019,911	107,147	1,626,487	139,770	628,910	51,540	115,552	10,970
Cod	951,109	93,276	1,049,335	109,924	1,089,292	120,367	1,171,568	136,585	1,036,311	135,947
Crevalle							141	12		
Croaker	191,075	14,384	119,036	9,938	109,425	9,729	2,388	270	346	21
Cunner	1,111	58	951	23	903	58	3,636	337	181	19
Cusk	5,338	281	10,489	603	6,271	315	2,402	105	31,211	2,375
Drum, black	13,088	489	648	27	5,358	332	8,741	641	18,086	1,388
Eel	245,698	26,667	233,724	24,657	121,578	15,754	286,659	48,881	48,291	6,355
Eel, conger							4,574	171	20,538	924
Flounders	943,280	55,409	1,545,895	119,407	1,852,084	115,534	1,683,778	124,107	753,110	74,821
Garfish	180	16	120	16			200	8		
Goosefish			300	6	768	29	1,919	133		
Grayfish					7,900	173	1,284	87	240	10
Grouper					2,573	232	4,895	672	983	105
Haddock	221,603	15,004	219,929	17,137	182,490	17,569	337,871	34,099	258,822	27,070
Hake	285,635	17,497	366,020	16,248	683,441	21,804	87,312	5,692	12,639	1,299
Halibut	327,878	65,239	196,939	43,756	185,670	42,842	235,559	53,772	216,380	45,501
Herring, sea	473,868	22,769	430,384	18,393	396,201	17,711	140,979	8,946	47,887	3,049
Hickory shad							1,503	55		
Hogfish or pigfish							662	59	1,279	156
Jewfish					25,400	2,021	1,871	187	512	63
Kingfish	6,219	1,677	23,570	4,825	49,531	6,079	21,974	3,532	5,023	1,269
Mackerel	829,628	107,718	870,245	104,043	96,199	18,959	106,576	18,965	2,762	436
Mackerel, Spanish	16,827	3,427	24,035	4,465	178,834	35,572	371,909	70,857	475,792	73,397
Menhaden	29,638	697	33,379	715	1,550	31			128	13
Mud shad					745	32	2,979	106	2,425	673
Mullet	1,219	122	34,184	3,643	72,759	5,816	42,337	3,789	45,740	4,417
Mummichog									593	35
Perch, white	4,419	621	5,637	742	60,440	9,450	50,831	8,675	628	6,154

Perch, yellow	145,087	21,246	141,154	19,849	141,494	17,919	49,209	7,576	34,283	4,899
Pickerel or grass pike	118,136	18,039	111,582	15,104	77,768	11,600	44,535	7,307	38,336	6,635
Pike perch (blue, yellow, or wall-eyed)	349,793	62,933	266,292	52,378	177,284	37,671	66,443	19,460	40,799	12,383
Pilotfish					435	38				
Pollock	342,944	27,530	1,009,504	62,953	639,092	46,476	769,781	58,325	106,053	12,441
Pompano	1,972	430	2,817	580	4,108	1,146	5,284	1,761	12,539	4,002
Salmon:										
Atlantic	12,660	2,287	5,242	1,044					7,485	1,672
Blueback			2,042	350						
Chinook	34,155	5,897	18,557	3,086	287	73				
Chum	35,767	3,962	108,672	16,930	112,402	17,824			48,582	5,377
Humpback	6,000	660								
Silver	44,475	8,113	135,166	26,418	103,968	19,366	6,723	1,966	57,182	10,399
Steelhead	64,782	7,860	1,681	184	150	27	23,176	7,587	31,851	7,182
Scup or porgy	99,822	10,682	31,539	3,203	6,850	1,059	1,512	190	163	19
Sea bass	184,944	27,820	67,500	13,690	99,915	15,364	73,735	13,976	60,410	10,793
Sea robin	37,113	1,053	12,473	374					450	12
Sergeantfish					2,561	214			6,258	777
Shad	176	8	161	35	12,450	2,190	33,841	7,769	40,214	10,931
Sharks	17,190	556	9,208	322	6,639	303	1,019	90	1,799	93
Sheepshead or fresh-water drum	24,508	2,170	29,721	2,947	5,841	482	2,972	349	22,104	2,880
Sheepshead, salt-water			5,960	646	10,984	1,379	16,335	2,622	1,396	320
Silverside or spearing	17,509	990	27,803	1,410	39,861	2,206	14,323	807	1,315	77
Skates	18,483	586	37,759	1,113	35,901	1,303	22,753	1,082	33,307	1,271
Smelt	12,561	1,911	166,867	26,107	274,259	55,074	482,076	90,668	534,198	104,515
Snapper, red			390	73	11,795	1,834	6,455	1,110	6,773	1,337
Snapper, other			552	69	2,117	337				
Spoonbill cat			14,009	2,632	15,404	3,196	28,859	6,981	11,981	2,731
Spot or Lafayette	53,594	2,578	117,731	4,085	23,219	2,023	6,469	707	48,250	4,349
Squeteague or weakfish	759,030	96,994	697,986	82,642	412,409	65,694	123,534	24,773	136,579	27,771
Squid	158,343	11,063	147,154	9,133	129,225	6,403	20,741	1,081	81,796	4,046
Striped bass	5,258	1,418	50,827	11,308	65,801	16,426	65,288	17,247	21,837	6,921
Sturgeon	9,384	2,666	39,768	11,700	20,256	5,698	1,762	449	887	174
Suckers	251,644	27,753	233,893	25,524	150,621	19,159	166,630	22,831	134,558	18,715
Sunfish	24,538	1,825	45,458	4,105	37,545	3,270	28,361	2,720	22,734	2,045
Swordfish			3,960	267			100	15	500	100
Tautog or blackfish	15,176	1,512	55,735	4,940	47,545	4,526	13,980	1,761	778	96
Tilefish	82,153	6,336	264,517	21,830	217,199	20,129	135,621	13,866	107,526	12,211
Tomcod			1,280	98	11,098	562	115,569	7,116	99,182	6,228
Trout:										
Brook	1,746	1,177	1,320	949	367	251	265	189	1,238	658
Lake	22,025	3,305	34,168	4,931	40,697	4,625			241	30
Salmon	6,058	617	8,449	1,217	13,575	2,087	1,447	229	3,521	757
Whitebait	758	77	1,445	288	6,987	860	1,728	263	106	31
White bass	7,597	911	11,719	1,124	2,074	261			2,066	386
Whitefish	43,534	9,418	156,905	30,561	189,204	32,990	38,489	8,417	5,275	872
Whiting	744,955	33,958	1,403,546	53,111	1,984,718	60,275	269,913	11,989	155,177	6,267
Yellowtail or silver perch	7,080	332	7,465	381					4,803	416
Miscellaneous	38,902	4,268	50,444	4,152	17,384	1,698	28,625	3,184	18,139	1,495
Total	11,444,467	1,202,284	13,471,111	1,330,050	13,216,941	1,211,476	9,068,039	1,082,275	6,362,952	906,953

Of the preceding, the following were landed by fishing vessels:

Species.	September.		October.		November.		December.		January.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Albacore or horse mackerel	868	$55	176	$12						
Bluefish	52,332	15,360	143,515	36,356						
Bonito	8,795	1,099	1,922	327						
Butterfish	391	51								
Cod	54,309	3,826	139,718	13,422	107,507	$9,417	28,437	$2,660	2,704	$353
Croaker			72	6	4,492	404				
Eel			142	5			168	26	142	19
Eel, conger									926	46
Flounders	7,288	905	7,088	876	8,732	200				
Grayfish					7,900	173	1,205	84		
Haddock	2,677	214	15,984	1,520	9,671	1,012	2,881	315	135	18
Hake	563	23	2,015	135	1,693	86	533	27	605	59
Herring, sea	7,017	300								
Mackerel	377	56								
Menhaden	8,262	103								
Pollock	498	37	3,215	236	3,457	277	373	32		
Scup or porgy	29,454	3,150	1,655	269						
Sea bass	1,953	284	3,018	630	5,508	1,053				
Skates	116	4	2,139	56	840	33	1,497	90	4,284	204
Spot	4,373	384								
Squeteague or weakfish	33,464	4,327								
Tilefish	82,153	6,335	256,917	21,227	214,924	19,911	127,052	13,001	105,874	12,021
Whiting	1,560	100			266	11				
Other fish	297	27			73	5				
Total	296,747	36,640	577,576	75,077	365,063	32,582	162,146	16,235	114,670	12,720

FISHERIES OF LAKE PEPIN AND LAKE KEOKUK.

A statistical canvass of the fisheries of Lakes Pepin and Keokuk for 1917 was made during the year, covering the same ground as in the canvass of these lakes for the year 1914. Lake Pepin is about 25 miles long, being an expansion of the Mississippi River between Minnesota and Wisconsin. Lake Keokuk, which was called Lake Cooper in the returns for 1914, but changed to Lake Keokuk by the United States Geographic Board, is formed by the dam across the Mississippi River at Keokuk, Iowa, the water backing up for a distance of about 50 miles.

Since the building of the dam, much speculation has been indulged in by the fishermen as to its effect on the fishing in the upper river. Considerable interest, therefore, attaches to the statistics of the fisheries in these lakes for the years mentioned, the first canvass having covered the first calendar year following the closing of the dam.

Lake Pepin.—In 1917 there were 131 persons engaged in the fisheries of this lake; the value of boats, fishing apparatus, and shore and accessory property employed was $59,051; and the products taken amounted to 1,212,809 pounds of fish, having a value to the fishermen of $78,555.

The most important forms of fishing apparatus used were fyke nets, seines, and anchored gill nets. Fyke nets, known locally as hoop nets, took 595,769 pounds of fish, or 49.1 per cent of the total catch, valued at $46,333; seines, 459,504 pounds, or 37.8 per cent, valued at $21,929; and anchored gill nets, 150,465 pounds, or 12.4 per cent, valued at $9,991. The remainder of the catch, amounting to 7,071 pounds, valued at $302, was taken with trap nets and trot lines.

The principal species taken were buffalofish, catfish, fresh-water drum, and Asiatic carp. These species constituted about 94 per cent of the total output. A number of other species, including bowfin, quillback or white carp, and suckers, were also taken in considerable quantities.

Compared with the returns for 1914, there was a slight decrease in the number of persons engaged, but an increase of $15,452, or 35.4 per cent, in the amount of capital invested, and of 454,139 pounds, or 59.8 per cent, in the quantity, and $44,836, or 132.9 per cent, in the value of the products. There was a large increase in the catch of bowfin or dogfish, buffalofish, catfish, Asiatic carp, and mooneye, but a decrease in fresh-water drum, quillback, spoonbill, lake sturgeon, and suckers.

Lake Keokuk.—The number of persons engaged in the fisheries of this lake in 1917 was 118, the value of boats, fishing apparatus, and shore and accessory property was $21,879; and the products amounted to 1,800,986 pounds, valued at $89,117.

Fyke nets were the most important fishing apparatus used, the catch amounting to 1,670,657 pounds of fish, or 92.7 per cent of the total output, valued at $82,491. Trammel nets were next in importance, with a catch of 89,346 pounds, or 4.9 per cent of the total, valued at $3,625. The remainder of the products were taken with seines, anchored gill nets, trap nets, and trot lines.

The leading species taken in this lake were buffalofish, catfish, fresh-water drum, and Asiatic carp, and constituted about 96 per

cent of the total catch. Blackbass, bowfin, crappie, eels, quillback or white carp, sunfish, and various other species were taken in smaller quantities.

Compared with 1914, there was an increase of 12.3 per cent in the number of persons engaged, 35.1 per cent in the investment, and 1,139,851 pounds, or 172.4 per cent, in the quantity, and $65,817, or 282.4 per cent, in the value of the products. The catch of black bass increased from 15 pounds, valued at $1, to 4,163 pounds, valued at $418; crappie, from 70 pounds, valued at $4, to 17,560 pounds, valued at $1,103; and sunfish from 50 pounds, valued at $3, to 13,879 pounds, valued at $813. There was also a large increase in the catch of buffalofish, catfish, fresh-water drum, and Asiatic carp. A decrease occurred in the catch of eels, sand sturgeon, and suckers. The species reported in 1917 which were not shown in the returns for 1914 were bowfin or dogfish, pike, quillback or white carp, and spoonbill cat or paddlefish.

Statistics of the fisheries of these lakes in 1917, and also comparative statistics for the years 1914 and 1917, are given in detail in the following table:

FISHERIES OF LAKE PEPIN AND LAKE KEOKUK (MISSISSIPPI RIVER) IN 1917.

Items.	Lake Pepin.		Lake Keokuk.	
	Number.	*Value.*	*Number.*	*Value.*
Persons engaged:				
Fishermen	126	.....	118	.....
Shoresmen	5	.....	.....	.....
Total	131	.....	118	.....
Boats, apparatus, and other property:				
Gasoline boats	35	$6,810	52	$4,730
Rowboats and barges	52	1,395	64	810
Houseboats	3	250	16	3,975
Fyke nets	262	37,472	1,368	8,929
Seines	17	6,460	1	800
Anchored gill nets	371	2,350	12	180
Trammel nets	.....	.....	17	472
Trap nets	14	450	81	221
Trot-lines	.....	13	.....	132
Shore and accessory property	.....	3,851	.....	1,630
Total	.....	59,051	.....	21,879
Products by apparatus:				
With seines—				
Bowfin (dogfish) pounds	3,792	79	.....	.....
Buffalofish do	60,072	3,457	878	64
Carp do	275,439	12,210	6,197	329
Catfish do	52,041	4,252	2,422	235
Crappie do	.....	.....	16	1
Fresh-water drum do	52,742	1,381	1,417	85
Mooneye, smoked do	650	195	.....	.....
Pike do	.....	.....	4	1
Quillback or white carp do	9,245	136	.....	.....
Spoonbill cat or paddlefish do	1,375	83	512	35
Sturgeon, lake do	40	9	.....	.....
Suckers do	4,108	127	.....	.....
Total	459,504	21,929	11,446	750
With fyke nets—				
Black bass pounds	.....	.....	4,163	418
Bowfin (dogfish) do	20,229	263	26,000	390
Buffalofish do	208,994	18,950	667,946	39,088
Carp do	100,422	6,411	678,149	25,253
Catfish do	175,535	17,524	97,486	7,089
Crappie do	.....	.....	17,544	1,102
Fresh-water drum do	59,839	1,926	158,058	7,991
Mooneye, fresh do	7,656	77	.....	.....
Mooneye, smoked do	6,600	660	.....	.....

FISHERIES OF LAKE PEPIN AND LAKE KEOKUK (MISSISSIPPI RIVER) IN 1917—Continued.

Items.	Lake Pepin.		Lake Keokuk.	
	Number.	*Value.*	*Number.*	*Value.*
Products by apparatus—Continued.				
With fyke nets—Continued.				
Pike.....pounds..	.....	.....	16	$2
Quillback or white carp.....do....	4,576	$113	5,936	244
Spoonbill cat or paddlefish.....do....	766	64	415	33
Sturgeon, sand.....do....	.....	.....	365	30
Suckers.....do....	11,152	345	700	38
Sunfish.....do....	.....	.....	13,879	813
Total.....	595,769	46,333	1,670,657	82,491
With anchored gill nets—				
Buffalofish.....pounds..	31,742	2,602	5,625	461
Carp.....do....	90,947	4,623	4,500	302
Catfish.....do....	25,832	2,583	1,010	92
Fresh-water drum.....do....	273	10	112	6
Quillback or white carp.....do....	417	10	.....	.....
Spoonbill cat or paddlefish.....do....	782	68	.....	.....
Sturgeon, lake.....do....	472	95	.....	.....
Total.....	150,465	9,991	11,247	861
With trammel nets—				
Buffalofish.....pounds..	.....	.....	22,094	950
Carp.....do....	.....	.....	67,252	2,675
Total.....	.....	.....	89,346	3,625
With trap nets—				
Catfish.....pounds..	396	40	1,668	150
Fresh-water drum.....do....	5,450	191	.....	.....
Total.....	5,846	231	1,668	150
With trot-lines—				
Carp.....pounds..	780	33	6,161	241
Catfish.....do....	445	38	7,318	626
Eels.....do....	.....	.....	2,087	318
Fresh-water drum.....do....	.....	.....	967	48
Sturgeon, sand.....do....	.....	.....	89	7
Total.....	1,225	71	16,622	1,240
Grand total.....	1,212,809	78,555	1,800,986	89,117
Products by species:				
Black bass.....pounds..	.....	.....	4,163	418
Bowfin (dogfish).....do....	24,021	342	26,000	390
Buffalofish.....do....	300,808	25,009	696,543	40,563
Carp.....do....	467,588	23,277	762,259	28,800
Catfish.....do....	254,249	24,437	109,904	8,192
Crappie.....do....	.....	.....	17,560	1,103
Eels.....do....	.....	.....	2,087	318
Fresh-water drum.....do....	118,304	3,508	160,554	8,130
Mooneye, fresh.....do....	7,656	77	.....	.....
Mooneye, smoked.....do....	7,250	855	.....	.....
Pike.....do....	.....	.....	20	3
Quillback or white carp.....do....	14,238	259	5,936	244
Spoonbill cat or paddlefish.....do....	2,923	215	927	68
Sturgeon, lake.....do....	512	104	.....	.....
Sturgeon, sand.....do....	.....	.....	454	37
Suckers.....do....	15,260	472	700	38
Sunfish.....do....	.....	.....	13,879	813
Total.....	1,212,809	78,555	1,800,986	89,117

COMPARATIVE STATISTICS OF THE FISHERIES OF LAKES PEPIN AND KEOKUK FOR THE YEARS 1914 AND 1917.

Items.	1914		1917	
LAKE PEPIN.	*Number.*	*Value.*	*Number.*	*Value.*
Persons engaged:				
Fishermen	135	.....	126	.....
Shoresmen	2	.....	5	.....
Total	137	.....	131	.....
Boats, apparatus, and other property:				
Gasoline boats	28	$7,625	35	$6,810
Rowboats and barges	a 53	1,300	52	1,395
Houseboats	1	100	3	250
Fyke nets	295	24,995	262	37,472
Seines	14	3,340	17	6,460
Anchored gill nets	664	4,421	371	2,350
Trap nets	8	480	14	450
Trot and hand lines	.....	3	.....	b 13
Shore and accessory property	.....	1,335	.....	3,851
Total	.....	43,599	.....	59,051
Products:				
Bowfin (dogfish) ..... pounds	1,534	16	24,021	342
Buffalofish ..... do	261,250	19,728	300,808	25,009
Carp ..... do	237,517	7,623	467,588	23,277
Catfish ..... do	26,830	1,745	254,229	24,437
Fresh-water drum ..... do	131,785	2,450	118,304	3,508
Mooneye, fresh ..... do	9,300	88	7,656	77
Mooneye, smoked ..... do	1,465	70	7,250	855
Pike ..... do	50	5	.....	.....
Quillback or white carp ..... do	60,605	864	14,238	259
Spoonbill cat or paddlefish ..... do	8,877	557	2,923	215
Sturgeon, lake ..... do	1,067	129	512	104
Suckers ..... do	18,340	439	15,260	472
Sunfish ..... do	50	5	.....	.....
Total	758,670	33,719	1,212,809	78,555
LAKE KEOKUK.				
Persons engaged: Fishermen	105	.....	118	.....
Boats, apparatus, and other property:				
Gasoline boats	36	3,870	52	4,730
Rowboats	84	1,250	64	810
Houseboats	10	1,075	16	3,975
Fyke nets	1,378	5,693	1,368	8,929
Seines	.....	.....	1	800
Anchored gill nets	.....	.....	12	180
Trammel nets	14	304	17	472
Trap nets	.....	.....	81	221
Trot and hand lines	.....	153	.....	b 132
Shore and accessory property	.....	3,845	.....	1,630
Total	.....	16,190	.....	21,879
Products:				
Black bass ..... pounds	15	1	4,163	418
Bowfin (dogfish) ..... do	.....	.....	26,000	390
Buffalofish ..... do	249,900	9,252	696,543	40,563
Carp ..... do	302,365	7,823	762,259	28,800
Catfish ..... do	71,535	4,855	109,904	8,192
Crappie ..... do	70	4	17,560	1,103
Eels ..... do	3,800	250	2,087	318
Fresh-water drum ..... do	26,860	827	160,554	8,130
Pike ..... do	.....	.....	20	3
Quillback or white carp ..... do	.....	.....	5,936	244
Spoonbill cat or paddlefish ..... do	.....	.....	927	68
Sturgeon, sand ..... do	c 1,900	121	454	37
Suckers ..... do	4,640	164	700	38
Sunfish ..... do	50	3	13,879	813
Total	661,135	23,300	1,800,986	89,117

a No barges were reported in 1914.
b No hand lines were reported for 1917.
c Reported as lake sturgeon in 1914.

ALASKA FISHERIES SERVICE.

EXTENT OF THE ALASKA FISHERIES.

In 1917 the fisheries of Alaska attained their highest development up to that time. The number of persons employed was 29,491, an increase of 5,497 over 1916. The capital invested was $54,937,549, an increase of $15,367,937. The value of the products as first placed on the markets was $51,466,980, an increase of $25,310,421. This marked advance in value, amounting to 96 per cent, was due partly to a larger catch and pack of important species, but mostly to an extraordinary increase of the market prices of canned salmon, ranging from 56 per cent for red salmon, 64 per cent for cohoes, 76 per cent for humpbacks, and 84 per cent for chums to 94 per cent for kings. The salmon industry continues to overshadow all other branches, and in 1917 surpassed all previous records as regards the quantity of products taken and the market value thereof. The augmented production was due in part to increased fishing and canning operations and in part to extremely heavy runs of fish in certain regions. The additional canneries numbered 18, including 3 which, while in existence in 1917, were not then devoted to salmon. Southeastern Alaska had a very heavy run of humpbacks, which gave an increased pack of more than 1,000,000 cases. In central Alaska there was a decline in the catch of both red and humpback salmon, but the Karluk and Alitak sections showed even larger runs of red salmon than in the exceptionally good year of 1916. Western Alaska had the largest catch of red salmon ever made there, aggregating more than 24,000,000 fish, or 2,500,000 in excess of the best previous year, 1914. The total number of salmon taken in all Alaska in 1917 was slightly over 92,600,000, of which 44,875,000 were humpbacks and 36,497,000 were reds.

The 118 salmon canneries in operation packed 5,947,286 cases (of 48 one-pound cans), valued at $46,304,090, an increase of more than 1,000,000 cases over 1916. The other products of the salmon industry—namely, fresh, frozen, mild-cured, pickled, dry-salted, and smoked fish—had a value of $1,473,991.

Ranking next to the salmon industry came the halibut fishery, with a catch valued at $1,120,226; the herring fishery, $767,729; the cod fishery, $744,976; and the whale fishery, $654,852, all of which were of greater value in 1917 than in the previous year.

Detailed statistics of all branches of the Alaska fisheries have been gathered by the Bureau and have been published, with discussion, in the annual report of the Alaska service.

TAX ON SALMON CANNED IN ALASKA.

The act of June 26, 1906, for the protection and regulation of the fisheries of Alaska, provides that packers of canned salmon shall pay a license tax on their output at a rate per case depending on the species packed. Salmon in Alaska is packed in cases containing 48 1-pound cans, 48 half-pound cans, or 96 half-pound cans. The bulk of the salmon is packed in 1-pound cans, 48 to the case. The Bureau of Fisheries has always assumed that a case of salmon for

the purpose of the law in question meant a definite amount, namely, 48 pounds of salmon, and in assembling statistics of the fisheries of Alaska it has consistently considered a package containing 48 half-pound cans of salmon as a half case.

Recently the clerk of the district court in southeastern Alaska, acting in accordance with an opinion by the United States attorney at Juneau, insisted that salmon canneries pay a license tax upon their canned product at so much per case, without reference to the quantity of salmon involved. This action was manifestly arbitrary in that the amount of taxes to be collected would be based not upon the quantity of salmon packed but upon a condition brought about by the desires of salmon packers or the changing notions of the public as to the size of case which could be handled to the best advantage.

The situation was brought to the attention of the Bureau of Fisheries by the Association of Pacific Fisheries. Upon the request of the Bureau, the Solicitor for the Department of Commerce rendered an opinion in regard to the matter, which was to the effect that a case of salmon within the meaning of the fisheries act of June 26, 1906, was a definite amount, 48 pounds of salmon. The matter was then referred to the Attorney General of the United States with the request that if he concurred in the opinion of the Solicitor, instructions be issued to the United States attorney at Juneau to enforce the collection of license taxes on that basis. The Attorney General concurred with the opinion of the Solicitor for the Department of Commerce, and instructions were issued to collect the tax on canned salmon in accordance therewith.

INSPECTION OF PRIVATE SALMON HATCHERIES.

Representatives of the Bureau have made the usual inspections of private salmon hatcheries maintained by companies engaged in salmon canning. Three of these plants, located at Loring, Quadra, and Hetta, were operated in 1917-18. Their work was in general found to be conducted in a satisfactory manner, but additional facilities for rearing salmon should be provided in order that they may fulfill their highest purpose. The output of these hatcheries during the fiscal year 1918 was 23,712,000 red-salmon fry, all of which were planted in local waters. Under the law, the rebates of taxes on canned fish allowed as an offset to the hatching operations amounted to $9,484.80.

WATERS CLOSED TO COMMERCIAL FISHING.

Pursuant to the authority conveyed by section 6 of the act approved June 26, 1906, and for the purpose of giving needed protection to salmon in various parts of Alaska, the following orders prohibiting or restricting salmon fishing were promulgated during the fiscal year 1918 after hearings held in accordance with law. The orders became effective on January 1, 1918.

Karluk River, under date of November 30, 1917.—That until further notice all fishing for salmon, or other fishing in the prosecution of which salmon are taken or injured, excepting only the native Indians taking limited numbers of salmon for their own consumption and not for sale or barter, be and is hereby prohibited in waters of Alaska, as follows: In Karluk River and Lagoon, and all tributary waters.

Bering River, under date of November 30, 1917.—That until further notice all fishing for salmon or other fishing in the prosecution of which salmon are taken or injured, be and is hereby prohibited in waters of Alaska, as follows: Bering River and all tributary waters, including Bering Lake, above a line extending at right angles across Bering River from a point approximately eight hundred (800) feet northwesterly from the mouth of Gandil River, Alaska.

Copper River, under date of December 29, 1917.—That until further notice all fishing for salmon, or other fishing in the prosecution of which salmon are taken or injured, in the Copper River and its delta, and all tributary waters, Alaska, be, and is hereby, made subject to the following limitations and prohibitions in addition to the general restrictions already applicable by virtue of existing laws and regulations:

1. Commercial fishing is prohibited in all waters of the Copper River delta from 6 a. m. on January 1 to 6 a. m. on June 1 of each year, and in the waters of Miles Lake and Abercrombie Canyon from 6 a. m. on January 1 to 6 a. m. on June 5 of each year.

2. A weekly close season from 6 p. m. Saturday to 6 a. m. of the Monday following shall be observed in all of the waters herein referred to, in which fishing is permitted.

3. Commercial fishing in the waters of the delta shall be limited to set nets, stake nets, and drift gill nets: *Provided, however,* That the four existing traps east of Cape Whitshed may be continued in operation, but without change of location or increase in size. No stake net, set net, or drift gill net shall exceed 1,000 feet in length. Only one stake net or set net shall be extended out from shore from one location, and no offshore stake nets or set nets will be permitted; the lateral distance interval between all such nets in the waters of the delta shall be not less than 1,800 feet.

4. All fishing is prohibited from the head of the delta to the foot of Miles Lake at all times.

5. All fishing in Miles Lake shall be limited to stake nets and set nets. No such nets shall exceed 600 feet in length, and only one such net shall be extended out from shore from one location; no offshore nets will be permitted in the lake. The lateral distance interval between all nets in Miles Lake shall be not less than 600 feet.

6. Fishing in Abercrombie Canyon shall be restricted to the use of dip nets operated by hand, such nets not to exceed 16 inches in greatest diameter and only one dip net shall be operated by a person. On the east side of the canyon there shall be distance intervals of at least 300 feet between fishermen operating dip nets. No fishing will be permitted in the so-called bear holes near the upper end of Abercrombie Canyon.

7. No fishing will be permitted at any time in the waters of the Copper River above Abercrombie Canyon, or in any of the waters tributary thereto, except in the case of local residents, who may take limited numbers of salmon for domestic use: *Provided,* That such fishing shall at no time be upon the spawning grounds of any salmon.

8. No set net or stake net shall be operated in any other than substantially a straight line.

9. For the purposes herein considered, the delta of the Copper River will be regarded as including all waters south of an east and west line passing through Mile 27 on the Copper River & Northwestern Railway, as at present established, and inside of a line from Point Martin to Cape Whitshed drawn so as to include the waters of the Martin Islands, the Egg Islands, and all tidal flats and islands between.

10. The lower end of Miles Lake shall be considered as at the bridge of the Copper River & Northwestern Railway at Mile 49. The upper end of Miles Lake shall be considered as at a point near Mile 52½ on the Copper River & Northwestern Railway where the river loses its identity in the lake, this point to be as indicated by notices posted by duly authorized representatives of the Bureau of Fisheries.

11. Abercrombie Canyon shall be considered as extending from the upper end of Miles Lake to Tunnel Point, near Mile 53½ on the Copper River & Northwestern Railway.

12. For the purposes of this order the following definitions are adopted to apply to the words in question where the same are used: "Stake net," a gill net attached or affixed to piles or stakes; "set net," an anchored gill net.

FISHERY PATROL AND STREAM WATCHMEN.

During the fishing season of 1917 the Bureau employed in the fishery patrol of the Alaskan coast two small vessels, named the *Murre* and the *Auklet*, after local sea birds, which had been built to order and put in commission in July. These are seaworthy craft, constructed after the well-tried salmon purse-seine boat, and have given entire satisfaction. In addition to the *Osprey*, which was put into commission in the latter part of the fiscal year, the Bureau hired for the fishery patrol of the Prince William Sound, Cook Inlet, and Nushagak regions a schooner and three launches.

For the season of 1918 there was placed in service at Fairbanks a boat which the Bureau had built for the use of its employees in connection with field work on the Yukon River and its tributaries. This boat will greatly facilitate the work of the wardens and others in enforcing the laws for the protection of fisheries and also fur-bearing animals in the interior of Alaska. This boat, named the *Swan*, is 32 feet in length and is equipped with a 20-horsepower motor. There are sleeping accommodations for two persons. Heretofore employees of the Bureau have been dependent upon private boats for transportation in these waters.

For the fishing season of 1918 the Bureau inaugurated an additional feature for securing the more adequate enforcement of the fishery laws. A number of temporary employees, designated as stream watchmen, were detailed to important fishing grounds in southeastern and central Alaska. Each watchman was assigned a limited area to patrol, which he was expected to keep under continuous observation. In certain regions where fishing is carried on by means of gill nets, haul and purse seines, or other movable apparatus, these watchmen will be much more effective than patrol boats. Patrol boats can enforce the law in respect to movable apparatus only while actually present at the fishing grounds where it is used. The appropriation necessarily limited the number of men who could be advantageously employed in this way. However, by selecting certain strategic points for operations and by shifting the watchmen from one stream to another in response to changing conditions in respect to fishery operations it is thought that a very considerable amount of protection may be afforded the fisheries at comparatively small cost.

Ten men were employed to undertake this work. Seven of them were secured through the dean of the University of Washington, five of the seven being students at the university and two being professors, while an eighth was a graduate of the university. One man was secured in the State of Washington, and the tenth man was engaged in southeastern Alaska. Five of the men were assigned to work in southeastern Alaska and five in central Alaska under the immediate direction of the Bureau's regular officers. A number of small boats were hired for the use of these men.

Various prosecutions have been instituted in the Alaska courts and before United States commissioners for violations of laws and regulations for the protection of salmon. The violations consisted mostly of nonobservance of the weekly close season, operation of gear within prohibited distances of other gear, and failure to mark

pound nets so that ownership could be determined. In most cases a plea of guilty was entered and fines were imposed.

CENSUS OF RED SALMON IN WOOD RIVER.

The Bureau has continued to make the annual count of the red salmon passing up Wood River to their spawning grounds in Lake Aleknagik. The 1917 census, conducted as in previous years, and with the usual indispensable assistance of the Alaska Packers Association and the Alaska-Portland Packers' Association, showed an escapement from the active fishing in the Nushagak River of 1,081,508 red fish between June 26 and August 1. The heaviest runs occurred on July 11 to 14, inclusive, when 529,588 fish were counted.

The purpose of this census has been fully explained in previous reports. The results since its inception have been as follows:

	Number.		Number.
1908	2,600,655	1913	753,109
1909	893,244	1915	259,341
1910	670,104	1916	551,959
1911	354,299	1917	1,081,508
1912	325,264		

FISHERY INTELLIGENCE SERVICE.

The Bureau has continued to carry out the wishes of the Legislature of Alaska, as set forth in a memorial asking that the Bureau of Fisheries, in conjunction with the Washington-Alaska Military Cable and Telegraph System, arrange to have the prices of fresh fish at Seattle and Ketchikan bulletined every day at the cable office of every town on the Alaska coast where fishing vessels call for the purpose of shipping fish southward and to have once a week the prices of salt fish of the varieties caught in Alaska waters bulletined at the cable offices of the Alaska coast. The War Department, which operates the Washington-Alaska Military Cable and Telegraph System, expressed its willingness to receive, transmit, and post bulletins furnished by the Bureau of Fisheries, and early in July, 1917, the service was initiated, the information thus furnished including (1) the forwarding each day, Sundays and holidays excepted, to Juneau, Petersburg, Ketchikan, Wrangell, Sitka, Valdez, Seward, Cordova, and Skagway the noon Seattle prices for fresh halibut, sablefish, and red rockfish; (2) inclusion with the Seattle quotations on Monday of each week the prices of pickled sablefish, salmon, and herring; and (3) the furnishing from Ketchikan of local information, corresponding to that furnished from Seattle, to the other Alaska towns supplied with the Seattle quotations. The purpose of this service is to keep the fishermen of this remote coast in touch with market conditions, so that they may dispose of their catches more profitably, and thereby be induced to increase the production of fish. The service has met with general favor.

FISHERY EXPLOITATION WORK.

The success which attended the Alaska work of the Bureau in the fishing season of 1917 in distributing literature and sending special assistants to the field to demonstrate practical operations, particularly

with respect to introducing the Scotch method of curing herring, encouraged it in renewing similar operations in the 1918 season. The results have proved the value of this undertaking, and there is every reason to believe that there will be a further gratifying increase in the production of herring and various more or less neglected fishes.

ESTABLISHMENT OF SALMON CANNERIES ON YUKON RIVER.

The proposed establishment in 1918 of a salmon cannery at Andreafski on the Yukon River brought forth strong protest from many quarters. It was advanced that cannery operations on the Yukon would deplete the supply of salmon upon which the natives living along the river and its tributaries depended in a large degree for their subsistence. It was also claimed that the white population would suffer if this source of food should be restricted to the extent feared. The Yukon and its tributaries drain a large extent of inhabited territory, and while most rivers in Alaska are fished near their mouths only, the waters of the Yukon are the scene of fishery operations from Bering Sea to points in Canada many hundreds of miles from the sea.

On account of the protests which were made, a hearing was held at Seattle on May 17, 1918, at which persons interested in the matter were given an opportunity to be heard. At the hearing it did not develop that there was any particular alarm in regard to the depletion that would be caused by the operation of a single cannery. The apprehension was that this particular cannery would be but one of many to be built, the aggregate result of which would be the depletion of the Yukon salmon supply. The Bureau has made arrangements to hold another hearing in regard to the matter at Seattle on November 20, 1918. Meanwhile, steps have been taken for a survey of the salmon resources of the Yukon and its tributaries and determination of the extent to which salmon are utilized by natives and other residents of the region in question. A number of employees of the Bureau have been detailed to make a special study of the situation on the ground. All persons known to be interested in the matter have been supplied with schedules to be filled out by them and returned to the Bureau, which it is hoped will develop further information. The Bureau of Education is cooperating with the Bureau of Fisheries in the matter, and officials of the Department of Justice in Alaska are rendering assistance.

PERMITS FOR COMMERCIAL FISHERY OPERATIONS IN ALEUTIAN ISLANDS.

In the fiscal year 1918 permits authorizing certain fishery operations within the Aleutian Islands Reservation were issued as follows:

1. Alaska Commercial Co., authorized to engage in the business of preserving cod and salmon for commercial purposes, erection of any cannery excepted.

2. Umnak Livestock Co., authorized to engage in the business of preserving cod and salmon for commercial purposes, erection of any cannery excepted.

3. Paul Buckley, authorized to engage in the business of taking and utilizing whales for commercial purposes, erection of any cannery excepted.

4. N. E. Bolshanin, authorized to engage in the business of salting cod and salmon for commercial purposes, erection of any cannery excepted.

5. Kuskokwim Fishing & Transportation Co., authorized to establish a shore station for use in connection with the taking and preservation of cod and salmon for commercial purposes, erection of any cannery excepted.

6. Alaska Fishing Co., authorized to take not to exceed 1,000 barrels of salmon and to sell the same either fresh or salted.

7. Northern Fisheries (Inc.), authorized to engage in the business of preserving cod for commercial purposes, erection of any cannery excepted.

8. Alaska Commercial Co., authorized to purchase fish from natives resident of the reservation and to preserve and sell the same for commercial purposes.

9. O. K. Quean, authorized to pack and dispose of for commercial purposes not to exceed 20 tons of cod and 200 barrels of salmon.

10. Edwin H. Larsen, authorized to establish and operate a saltery for use in connection with the taking and preservation of cod and salmon for commercial purposes.

11. Northern Fisheries (Inc.), authorized to engage in the pickling of salmon, trout, atkafish, and other fishes for commercial purposes.

12. Buckley Livestock, Fisheries & Transportation Co., authorized to engage in cod-fishery operations upon Unalaska Island and to build thereon suitable bunk houses, cookhouses, and storage buildings necessary to carry on the business of catching, salting, and otherwise curing codfish.

13. Buckley Livestock, Fisheries & Transportation Co., authorized to construct and operate on Unalaska Island a plant for the canning or salting of salmon or other food fishes taken in the vicinity of Unalaska Island.

14. Unalaska Atkafish Co., authorized to engage in the salting or mild curing of atkafish, codfish, and salmon for commercial purposes.

15. A. C. Goss, authorized to engage in miscellaneous fishery operations, construction or operation of any cannery excepted.

16. Alaska Fishing Co., authorized to engage in commercial fishery operations at Unalaska Island, construction or operation of any cannery excepted.

ALASKA FUR-SEAL SERVICE.

GENERAL ADMINISTRATIVE MATTERS.

A very full report on the fur-seal service in all its branches during the season of 1917 is contained in the document entitled "Alaska Fisheries and Fur Industries in 1917." This may be consulted by persons desiring to know details of the affairs of the Pribilof Islands natives, fur seals, foxes, reindeer, and other matters.

The greatly increased cost of supplies of all kinds rendered inadequate the appropriation for the fur-seal branch of the general Alaska service for 1918 and necessitated an appeal to Congress for a deficiency appropriation of $35,000, which became available in October, 1917.

In April, 1918, there were sent to the Pribilofs three motor trucks, two for St. Paul Island and one for St. George Island. Reports indicate that these trucks have already proved very useful in various ways; and with the gradual extension of road facilities, in which the trucks will be of great aid, their usefulness will undoubtedly increase.

It is gratifying to record that the natives of the Pribilof Islands responded in a patriotic way to the third call for Liberty Loan subscriptions. From funds held in the custody of the Commissioner of Fisheries for certain of these natives, seven on St. Paul and four on St. George requested that bonds aggregating $1,150 be purchased for them. One woman subscribed for $400. From funds due for taking fox skins, 24 natives subscribed for bonds aggregating $1,200, each of the 24 subscribing for a $50 bond.

The act providing for the sundry civil expenses of the Government for the fiscal year 1919 appropriated $20,000 for the purchase or construction of a wooden power lighter for use at the Pribilof Islands. Arrangements have been made for the construction of a suitable vessel. The craft will be about 70 feet in length and 17 feet in breadth, with a cargo capacity of 30 to 40 tons, and provided with an internal-combustion engine of about 80 horsepower. Sleeping accommodations will be available for 6 employees of the Bureau and for 10 natives. The vessel will be substantial and seaworthy, and able to make trips when necessary from the Pribilof Islands to Unalaska, a distance of 250 miles across Bering Sea. It is planned that the vessel will be ready for service next season.

Early in 1918, in response to the request of the Department of Commerce, the Navy Department arranged for the detail of a Coast Guard vessel for patrolling the North Pacific Ocean and Bering Sea for the protection of fur seals and sea otters. A patrol for the purpose indicated is required by the provisions of the North Pacific Sealing Convention of July 7, 1911.

In order to obviate the waste of such valuable products as oil and fertilizer, obtainable from the carcasses of seals, the installation of a reduction plant has been a great desideratum at the Pribilof Islands. Money for this purpose having been made available by the President, the necessary machinery, equipment, and other materials have been purchased and forwarded to St. Paul Island, and the plant will shortly be ready for use.

The transportation of persons and supplies to the seal islands and of persons and products therefrom has been efficiently performed by the steamer *Roosevelt*, which during the fiscal year made three trips from Seattle and gave the islands a more adequate service than was ever before possible. While operating expenses of this vessel are considerable, they are far less than would be required for the unsatisfactory transportation such as was formerly rendered by chartered vessels. In fact, the work performed by the *Roosevelt* during the year would, if done by a private vessel, have cost the Government a sum that would cover the purchase price of this vessel.

With the publication of Funsten Bros. & Co.'s catalogue which announced the sale of sealskins at St. Louis on April 22, 1918, there were formally adopted new terms for use in classifying sealskins.

The terms formerly used represented the fortuitous outgrowth of years and were in some cases misleading in that they gave the uninitiated the impression that skins were taken from seals which are never killed for commercial purposes at the Pribilofs. The new terms avoid the faults of the old, and each one means that the skin to which it is applied has a length varying only within specified limits. It is believed that this innovation will meet with general approval by the fur-buying public. A comparison of the old and new terms, with the size limits of the new terms, follows:

Old classification.	New classification.	Lengths.
		Inches.
Wigs	Wigs	Above 55
Middlings	Extra extra large	49 to 55
Middlings and smalls		
Smalls	Extra large	46 to 48
Large pups	Large	43 to 45
Middling pups	Mediums	39 to 42
Small pups	Small mediums	35 to 38

RESUMPTION OF SEAL KILLINGS FOR COMMERCIAL PURPOSES.

By the provisions of the act of Congress approved August 24, 1912, giving effect to the North Pacific Sealing Convention of July 7, 1911, it became permissible to take fur-seal skins for commercial purposes at the Pribilof Islands after August 24, 1917. The season when sealskins can be obtained for commercial purposes to best advantage ends about August 10, and for this reason no considerable number of skins were secured in 1917. Early in 1918 the Secretary of Commerce tentatively authorized the taking of 25,000 skins during 1918, this number to be increased later should the conditions warrant. The quota was apportioned between the two islands as follows: 20,000 to St. Paul Island and 5,000 to St. George Island. By July 31, 1918, the take of sealskins on St. Paul Island in the calendar year was 23,889 and on St. George Island 6,711. Following the unanimous opinion expressed by responsible Government representatives on the islands, the Secretary in July, 1918, authorized an increase in the season's quota from 25,000 to 35,000 skins, 28,000 being apportioned to St. Paul Island and 7,000 to St. George Island. To August 10, 1918, the skins taken numbered 33,881.

In connection with the expansion of sealing operations at the Pribilofs it was evident that outside assistance would be necessary on St. Paul Island if the desired number of skins was to be taken. Arrangements were accordingly made whereby Funsten Bros. & Co., of St. Louis, the firm which sells for the Department the sealskins taken at the Pribilofs, sent 5 men to assist with those features of the work which require more or less expert knowledge of the handling and care of furs. To supplement the services of the natives of St. Paul in the killing of seals, the taking of skins, etc., 11 natives were hired at Unalaska and taken to the islands early in the sealing season.

AUTHENTICATION OF FUR-SEAL SKINS TAKEN BY WASHINGTON INDIANS.

The Bureau has again had the cooperation of the superintendent of the United States Indian Service at Neah Bay, Wash., in the matter of authenticating fur-seal skins lawfully taken by Indians dwell-

ing on the coast of Washington. The North Pacific Sealing Convention of July 7, 1911, permits these Indians to take sealskins under certain restricted conditions.

To July 31, 1918, the skins thus authenticated numbered 395. The records submitted show that 388 of the seals involved were taken in April, May, and June, 1918. Information as to when the other 7 were captured is not stated but it is assumed that they were taken in the same months. The records also show that 251 of the seals were males, 142 females, the sex of 2 not being given. All of the seals were speared from canoes operating from 10 to 25 miles west of La Push, Wash.

While it is regretted that so large a proportion of female seals were captured, yet so long as the Indians are to have the privilege of taking seals it is not seen how the killing of females can be prevented. The Indians should undoubtedly continue to have the privilege which they now possess, and with the herd in its present condition the number of females taken can not materially affect its status.

CONDITION OF THE SEAL HERD.

The census of the Alaskan seal herd in 1917 gave a total of 468,692 seals of all ages. The census was again under the immediate charge of G. Dallas Hanna, of the Alaska service, who was assisted by Dr. Harold Heath and members of the islands staff. The 1918 census, although taken in the early part of the fiscal year 1919, should be noted in this report. It was made under the same circumstances as formerly, Mr. Hanna in charge and Dr. Heath assisting. The number of pups born was 143,005, representing an equal number of breeding cows, and the total strength of the herd as of date of August 10 was computed to be 496,611, exclusive of 33,881 seals killed for commercial purposes during the year. The only variation from former methods of calculation was to increase from 12½ to 20 per cent the annual natural mortality among the bulls, a course which appeared to be justified by information gained during this census.

The great preponderance of old male seals, resulting from the enforced suspension of commercial sealing for five years, is the only unsatisfactory feature of the herd. The breeding males on the islands in 1918 were sufficient for a herd of 740,000 cows, allowing 30 cows to a harem.

SALES OF PRIBILOF ISLANDS PRODUCTS.

During the fiscal year 1918 the revenue derived from the sale of products of the Pribilof Islands was $417,815.20 gross and $296,228.85 net, the difference being largely in the cost of dressing and dyeing sealskins before their sale at public auction. There were two sales of sealskins, in October, 1917, and April, 1918, the number disposed of being 9,339 and the gross receipts $379,392. Fox skins, taken during the winter of 1916–17, were sold in October, 1917, 567 being blue and 39 white; the gross receipts therefrom were $35,680.50. Two lots of old seal bones, aggregating 193,570 pounds, brought $2,742.70 gross.

MINOR FUR-BEARING ANIMALS OF ALASKA.

ENFORCEMENT OF LAWS AND REGULATIONS.

The wardens and other employees of the Bureau have enforced the laws and regulations for the protection of the minor fur-bearing animals throughout Alaska. This duty has been performed as efficiently as the number of the agents permitted. Through the cooperation of the governor of Alaska the Bureau will be enabled to increase its personnel for the protection of fur-bearing animals in Alaska by the employment of game wardens in the Territory as special fur wardens. In return the Bureau has authorized the governor to appoint a number of its wardens as ex-officio game wardens.

FURS SHIPPED FROM ALASKA.

It is indicated by statistics compiled by the Bureau that during the period from November 16, 1916, to November 15, 1917, the value of the furs shipped from Alaska was $1,028,719, exclusive of the fur seal and fox skins of the Pribilof Islands, as against $911,244 in the preceding similar period. In a number of instances there was a decrease in the number of pelts shipped, but the average price of practically all furs showed a material advance, hence the aggregate value of the shipments in 1917 was considerably greater than that of the previous year.

Acknowledgment is made of the cooperation of the Post Office Department in securing accurate statistics of shipments of furs by mail. The arrangements in effect for several years were reaffirmed when under date of May 4, 1917, the Postmaster General issued an order slightly modifying the previous arrangement. It is now the duty of each postmaster in Alaska to furnish report blanks prepared by the Bureau of Fisheries to persons who present furs for mailing, and to see that no furs are sent to outside points until after the shipper has filled out the blank. The postmaster signs the blank and dispatches the shipment of furs without examining the contents. The report is forwarded to the Bureau of Fisheries.

NEW REGULATIONS FOR PROTECTION OF FUR-BEARING ANIMALS.

The only change made in the fiscal year 1918 in the regulations for the protection of fur-bearing animals in Alaska was one approved by the Secretary of Commerce under date of March 4, 1918, extending the close season on beaver until November 1, 1923. This change was made at the request of the Bureau, and was based in large part on the recommendations of wardens in its service and at the solicitation of the governor of Alaska and other persons having the welfare of the Territory at heart.

Beavers in Alaska have been afforded entire protection for a number of years and the resulting increase in their numbers has fully justified the action of the Department in the past. It was felt, however, that the reestablishment of the beaver in Alaska had been local rather than general, and that since the colonial habits of the beaver make extermination a comparatively easy matter, there should be complete protection for a further period of five years.

FUR FARMING IN ALASKA.

As for a number of years past, there has been some activity in fur farming. This has consisted chiefly of the liberation of adult foxes on islands, although in a number of instances corrals have been constructed and the work has been conducted along scientific and businesslike lines. Reports have been received indicating that there were 8 fur farms in operation in the interior of Alaska and that 20 islands were occupied for the breeding of fur-bearing animals. At the end of the fiscal year 1918 five islands under the jurisdiction of the Department had been leased for the propagation of fur-bearing animals; these were Middleton, Simeonof, Little Koniuji, Marmot, and Pearl Islands. The lease of Marmot Island was forfeited in 1918.

MISCELLANEOUS MATTERS.

SPECIAL CONSTRUCTIONS AND IMPROVEMENTS.

In January, 1918, the Rhode Island Legislature granted the United States permission to purchase the property which the Bureau has desired to acquire on Block Island for a marine fish hatchery. The land has since been purchased, title thereto has been perfected, plans for the station have been made, and construction will be begun if the greatly increased cost of material and labor will permit the completion of the hatchery and pumping plant within the appropriation.

No bid within the limit of the appropriation could be obtained for the new motor boat authorized for the Woods Hole (Mass.) station. The construction of two steel fish-distribution cars has not been possible, owing to the inability of properly equipped establishments to handle this kind of work at this time. Another piece of construction work that has lapsed is the lobster-rearing plant for which Congress made a small appropriation in 1917. The reduction of the size of this proposed plant to a point that greatly impairs its value still leaves its estimated cost far in excess of the appropriation. The project will have to be held in abeyance or Congress must increase the appropriation.

With the additional appropriation for the laboratory at Key West, Fla., there have been constructed a director's residence and a pump house, both of terra cotta hollow tile, and a concrete cistern for fresh water with a capacity of 2,000 gallons.

At the Cape Vincent (N. Y.) station, new machinery has been installed, and the purchase of about 7.5 acres of additional land is contemplated in order to construct ponds and institute pond culture at this point.

A double frame building for quarters has been built at the Bozeman (Mont.) station. Each part is 30 by 50 feet and contains 6 rooms.

At the Orangeburg (S. C.) station 5 new ponds have been constructed, and at the Saratoga (Wyo.) station 2 new ponds have been completed, and there have been extensive improvements to the water supply, including the addition of a filtering system.

VESSEL SERVICE.

The repairs which the steamer *Albatross* was undergoing at the Mare Island Navy Yard at the beginning of the year were completed

early in November, and on the 19th of that month the vessel was formally taken over by the Navy for the period of the war.

The steamer *Fish Hawk* was used by the Navy under an informal agreement from July 1 until January 11, when the vessel was sent to the yard of the Old Dominion Marine Railway Corporation at Berkley, Va., for repairs to hull and machinery, for which a special appropriation was provided. The principal items of work on the hull embrace a complete overhauling throughout, rebolting of sheathing, replacing worn plates, rearranging and modernizing space and quarters, a new keel, and a new main deck. There were installed a new condenser and fore-and-aft compound engines, designed to develop 200 horsepower. Although the repairs were not completed until August, 1918, the vessel was taken over by the Navy on July 18.

Two of the smaller steamers of the Bureau, the *Halcyon* and the *Phalarope*, have also been at the disposal of the Navy Department during the entire year.

Three of the older vessels, the *Grampus*, the *Curlew*, and the *Blue Wing*, having outlived their usefulness, have been condemned and sold.

While the *Roosevelt* was discharging cargo of supplies at the seal islands in May, 1918, an epidemic which had broken out among the crew was diagnosed as diphtheria. After the administration of antitoxin by the physician at St. Paul Island, the *Roosevelt* proceeded to Unalaska to enter quarantine. While there a situation developed which led to the *Roosevelt's* making a most noteworthy series of rescues of lives and vessels. A number of cannery vessels had become caught in the ice in Bering Sea, and a great loss of life and property was imminent. Request was made for the assistance of the Coast Guard cutter *Unalga* and of the *Roosevelt.* The *Roosevelt* started out on the rescue work as soon as possible, and by reason of its construction the master was able to take it through the heavy pack ice and to meet the emergency in a way which probably could not have been done with any other vessel afloat. In the course of the operations the *Roosevelt* rescued the *St. Nicholas*, the *Centennial*, and the *Star of Chile.* Twenty-one persons from the wrecked vessel *Tacoma* were also rescued from a water-logged iceberg. It was estimated that at the time of rendering assistance to the *St. Nicholas* that vessel could not have survived more than 12 hours; more than 300 persons were aboard. The *Centennial*, with 161 persons aboard, might have survived another week at the time of its rescue.

FISHERY MATTERS IN CONGRESS.

No legislation affecting the Bureau aside from appropriation bills was passed by Congress during the fiscal year 1918, but a number of important measures in which the Bureau is concerned or interested were introduced and considered by the appropriate committees, including (1) a bill authorizing the construction of a building for the Bureau of Fisheries in the District of Columbia, (2) a bill to protect and conserve the halibut fisheries of the Pacific Ocean, (3) a bill to prohibit traffic in lobsters taken outside the territorial waters of Canada by United States vessels during the close season for lobsters in such waters, and (4) bills transferring the control of the fisheries of Alaska to the Territorial Legislature.

A bill to ratify the agreement or compact between the States of Washington and Oregon regarding concurrent jurisdiction over the Columbia River in connection with the fisheries passed the House of Representatives in March, the Senate in April, and became a law on April 8, 1918. The passage of this bill was advocated by the Bureau because of the stability it gives to laws for the protection of the salmon in the Columbia River.

AMERICAN-CANADIAN FISHERIES CONFERENCE.

The Commissioner was associated with the Secretary and the Assistant Secretary of Commerce as a member of the American-Canadian Fisheries Conference, appointed to consider outstanding fishery questions between the United States and Canada. Following meetings in Washington, D. C., in January, 1918, the conference held public hearings in Boston and Gloucester, Mass., St. John, New Brunswick, Seattle, Wash., Ketchikan, Alaska, and Vancouver and New Westminster, British Columbia. At a meeting of the conference in Ottawa in May, adjournment was taken until September, in order that the testimony and exhibits might be fully considered before the preparation of a final report with findings and recommendations. The subjects that came before the conference were:

1. Privileges to the fishing vessels of either country in the ports of the other.
2. Rehabilitation and protection of the sockeye salmon of the Fraser River system.
3. Protection of the Pacific halibut fishery.
4. Fishing by United States lobster well-smacks off Canadian coast.
5. Protection of the fisheries of Lake Champlain.
6. Requirements imposed on Canadian fishing vessels passing through territorial waters of Alaska.
7. Protection of the sturgeon fisheries.
8. International protection of whales.

As an emergency war measure, in order that no restrictions may be placed on the production of food, the two Governments have reached an agreement under which the fishing vessels of either country are accorded in the ports of the other all the privileges enjoyed by domestic vessels. A bill has been drawn and introduced in Congress having for its object the suppression of the United States traffic in lobsters caught off the Canadian coast when there is a close time for lobsters on that coast. The Canadian Government has taken the necessary action to give to the fish in the Canadian waters of Lake Champlain the same protection that is accorded in New York and Vermont. The former discriminatory practice of requiring Canadian fishing vessels passing through the territorial waters of Alaska to enter and clear has been discontinued. The other subjects before listed as coming before the conference will require legislation or a treaty, or both.

Respectfully submitted.

H. M. SMITH,
Commissioner of Fisheries.

To Hon. WILLIAM C. REDFIELD,
Secretary of Commerce.

THE DISTRIBUTION OF FISH AND FISH EGGS DURING THE FISCAL YEAR 1918

HENRY O'MALLEY
Assistant in Charge of Fish Culture

Appendix I to the Report of the U. S. Commissioner of Fisheries for 1918

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THE DISTRIBUTION OF FISH AND FISH EGGS DURING THE FISCAL YEAR 1918.

CHARACTER OF WORK.

Fully nine-tenths of the fish-cultural resources of the Bureau of Fisheries are devoted to the restoration and maintenance of the commercial fisheries of the United States. The eggs of such important commercial species as the salmons, shad, cod, whitefish, lake trout, pike perch, pollock, and flatfish would be sent to market in the fish and thus lost were they not taken by the Bureau from fish caught by commercial fishermen, and the fry developed therefrom in specially equipped hatcheries.

While it constitutes a comparatively small part of the Bureau's output, the upbuilding and extension of the fisheries of inland waters is by no means a negligible factor, comprising as it does the production and dissemination of valuable fresh-water fishes of many kinds for introduction into public lakes, streams, and ponds, and also for the stocking of preserves under private control. One of the leading features of this branch of the work is the furnishing of suitable stock fish for the establishment of a supply in the waters of regions far remote from the markets, where dependence for food fishes must be placed entirely on local resources.

Among the fishes most extensively cultivated for the fresh-water streams and lakes of the interior are several species of trout, the black basses, crappies, bream, and catfishes. Trout are artificially hatched from eggs which are taken from both wild and domesticated stock, while the supply of black bass and other pond fishes of the same general character is secured by allowing the mature fish to breed naturally in specially prepared ponds. Owing to the great demand for fishes suitable for culture in ponds, the Bureau is compelled to supplement its station supplies by making collections of young fishes which become stranded each season on the overflowed lands adjacent to the Mississippi and Illinois Rivers. Less than 1 per cent of the fishes thus obtained are reserved for distribution in distant waters, while the remainder are either returned to the main channels of these rivers or placed in their immediate tributaries.

Prevailing weather conditions have a great deal to do with the measure of success attained in the Bureau's annual rescue operations in the Mississippi Valley. Sometimes it is impossible to secure

young fish of the desired varieties in that field in numbers sufficient to fill all applications, which contingency necessitates the continuance of the unfilled applications on file for attention during the succeeding year. This accounts for the delay in supplying pond fishes to applicants in the great majority of instances. Rescue work can not be undertaken until the rivers have attained a low-water stage. This is usually in July or August, and, owing to the short season in which collections are possible, the Bureau has adopted the policy of not listing for supply during the current year any applications received later than July 1. In this way the duplication of trips to many sections of the country is obviated, and the expense of the distribution work is kept down to a minimum.

The salvage of fishes from temporary lagoons and lakes is of great importance, as it means the conservation of millions of fish which would otherwise be lost, either through the drying or the freezing of the waters. The Bureau has received valuable assistance in this work from various State fisheries authorities, club representatives, and public-spirited citizens of the Mississippi Valley.

METHOD OF DISTRIBUTION.

The fry hatched from the shad, whitefish, salmons, lake trout, lake herring, pike perch, white perch, yellow perch, striped bass, cod, lobster, pollock, flounder, and haddock are planted on the spawning grounds from which the eggs are derived or utilized for the stocking of new and suitable waters in an effort to extend the fisheries.

With respect to the game and food fishes of the interior, which are propagated in comparatively small numbers, provision is made for the return of a sufficient number of young fish to the waters where eggs are collected for the maintenance of the supply therein; the remainder of the stock is then assigned to suitable lakes or streams for which applications have been submitted by responsible individuals. This class includes the various trouts, basses, sunfishes, and catfishes.

Blanks upon which formal applications for fish can be made are furnished by the Bureau on request. Upon the receipt of applications properly executed and bearing the indorsement of a United States Senator or Representative, an assignment of fish is made, suitable for the waters described and to the Bureau's facilities to supply, and the delivery is arranged for as soon as possible thereafter. Applicants should confine their choice of fishes to species that are indigenous to the region of the waters to be stocked. Nonindigenous species of fishes are assigned only upon the recommendation of the State fisheries authorities, and not then unless such recommendation conforms to the Bureau's judgment.

The Bureau refuses requests for such predaceous fishes as the black bass, sunfish, and kindred species for introduction into waters in

California, Oregon, Washington, Idaho, Nevada, Wyoming, or western Montana, as it is believed their presence in such waters might prove harmful to the trout and salmon fisheries of that region.

Each species of fish spawns at a specific time during the year—the brook trout and the domesticated rainbow trout of eastern waters in the fall or early winter; the blackspotted trout, steelhead trout, and the wild rainbow trout of western waters during the spring; while all of the pond fishes reproduce in the spring or early summer.

The product of each season is distributed as the fish attain proper size for shipment, and after the exhaustion of the stock of one season no more are available until the same season the following year.

The distribution of trout in the Eastern States begins in March and is completed by the last of June, while trout shipments to applicants in the Middle States extend from about May 1 until well along in July. In the Rocky Mountain States the trout distributions occur somewhat later, the work usually starting by September 1 and continuing into the early winter.

The black basses produced at the Bureau's pond-cultural stations are distributed between May and August, while the miscellaneous fishes rescued from overflowed lands and the output of rock bass, crappie, sunfish, and catfish from these stations are shipped simultaneously, the distribution usually extending from August to December.

It is the policy of the Bureau to fill applications in the order of their receipt so far as practicable, but it is impossible to state definitely, in advance, when the fish requested by an applicant can be furnished, the approximate time of delivery depending upon transportation facilities, which are not always available on a given date, and, in the case of the pond or river fishes, upon the degree of success attained in the collections.

The number of fish assigned on an application must necessarily be governed by the available supply of the species requested and the time of year scheduled for the delivery, it being obvious that very young fishes which have not been fed can be furnished in much larger numbers than those which have been held at considerable expense at the Bureau's stations until they have attained the size of fingerlings. It is the aim of the Bureau in all cases to allot a sufficient number of a given species to form a brood stock for the water area described, and those interested in the lake or stream so stocked are relied upon to see that the fish are afforded proper protection by the restriction or prohibition of fishing until a sufficient length of time has elapsed for them to reproduce, a period which will vary from two to three years, according to the species furnished.

Fry or very young fish can be shipped in much larger numbers than those of the fingerling sizes. A 10-gallon transportation can will safely carry from 2,000 to 3,000 fry of the trouts or black basses,

from 500 to 1,000 one-inch fish of these species, and of those 2 inches long, from 100 to 300. It has been calculated that the varying numbers of the different sizes stated have practically equal value for stock purposes, as the losses in open waters from natural causes are in about the ratios indicated.

Some of the commercial species propagated –whitefish, pike perch, white perch, and shad, which are distributed only as fry—are so small that as many as 100,000 can be carried in a 10-gallon can.

Fish intended for applicants are carried to destination in specially equipped railroad cars belonging to the Bureau, or in the regular baggage cars attached to passenger trains, an experienced messenger accompanying them for the purpose of aerating the water en route. The only expense the applicant is put to in connection with the transaction is that of transporting the fish from the railroad station designated in the application to the waters in which they are to be liberated. Some days in advance of an intended delivery the consignee is notified and given detailed instructions regarding the reception and care of the fish after they are turned over to him. He is notified again by wire a few hours before the arrival, in order that he may meet the train and receive the consignment, which will be handed to him from the car by the messenger.

During the fiscal year ended June 30, 1918, the Bureau received 8,504 applications from individuals and associations for fish to stock public and private waters. Requests for blanks upon which to submit applications for fish should be addressed to the Commissioner of Fisheries, Washington, D. C.

SPECIES CULTIVATED.

During the fiscal year 1918 the Bureau handled some 50 species of fish and the lobster. Of these the following were produced at its regular propagating stations:

THE CATFISHES (SILURIDÆ):
- Horned pout, bullhead, yellow cat (*Ameiurus nebulosus*).
- Marbled cat (*Ameiurus nebulosus marmoratus*).

THE SUCKERS AND BUFFALOFISHES (CATOSTOMIDÆ):
- Smallmouth buffalofish (*Ictiobus bubalus*).
- Common buffalofish (*Ictiobus cyprinella*).
- Black buffalofish (*Ictiobus urus*).

THE SHADS AND HERRINGS (CLUPEIDÆ):
- Shad (*Alosa sapidissima*).
- Alewife (*Pomolobus pseudoharengus*).

THE SALMONS, TROUTS, WHITEFISHES, ETC. (SALMONIDÆ):
- Common whitefish (*Coregonus albus* and *C. clupeaformis*).
- Lake herring, cisco (*Leucichthys artedi*).
- Chinook salmon, king salmon, quinnat salmon (*Oncorhynchus tschawytscha*).
- Silver salmon, coho (*Oncorhynchus kisutch*).
- Blueback salmon, redfish, sockeye (*Oncorhynchus nerka*).
- Humpback salmon (*Oncorhynchus gorbuscha*).
- Chum salmon (*Oncorhynchus keta*).

THE SALMONS, TROUTS, WHITEFISHES, ETC. (SALMONIDÆ)—Continued.
Steelhead (*Salmo gairdneri*).
Rainbow trout (*Salmo irideus*).
Atlantic salmon (*Salmo salar*).
Landlocked salmon (*Salmo sebago*).
Blackspotted trout, Yellowstone Lake trout, cutthroat trout (*Salmo lewisi*).
Loch Leven trout (*Salmo trutta levenensis*).
Lake trout, Mackinaw trout, longe, togue (*Cristivomer namaycush*).
Brook trout, speckled trout (*Salvelinus fontinalis*).
Sunapee trout (*Salvelinus aureolus*).
THE SMELTS (ARGENTINIDÆ):
American smelt (*Osmerus mordax*).
THE MACKERELS (SCOMBRIDÆ):
Common mackerel (*Scomber scombrus*).
THE BASSES, SUNFISHES, AND CRAPPIES (CENTRARCHIDÆ):
Crappie (*Pomoxis annularis*).
Rock bass, red-eye, goggle-eye (*Ambloplites rupestris*).
Warmouth, goggle-eye (*Chænobryttus gulosus*).
Smallmouth black bass (*Micropterus dolomieu*).
Largemouth black bass (*Micropterus salmoides*).
Bluegill sunfish (*Lepomis incisor*).
Other sunfishes, chiefly *Eupomotis gibbosus*.
THE PERCHES (PERCIDÆ):
Pike perch, wall-eyed pike, yellow pike, blue pike (*Stizostedion vitreum*).
Yellow perch, ring perch (*Perca flavescens*).
THE SEA BASSES (SERRANIDÆ):
Striped bass, rockfish (*Roccus lineatus*).
White perch (*Morone americana*).
THE CODS (GADIDÆ):
Cod (*Gadus callarias*).
Haddock (*Melanogrammus æglifinus*).
Pollock (*Pollachius virens*).
THE FLOUNDERS (PLEURONECTIDÆ):
Winter flounder, American flatfish (*Pseudopleuronectes americanus*).
CRUSTACEANS:
American lobster (*Homarus americanus*).

The fishes rescued from overflowed lands in the Mississippi Basin and returned to the original streams were as follows:

THE CATFISHES (SILURIDÆ):
Spotted cat, blue cat, channel cat (*Ictalurus punctatus*).
Horned pout, bullhead, yellow cat (*Ameiurus nebulosus*).
THE SUCKERS AND BUFFALOFISH (CATOSTOMIDÆ):
Common sucker (*Catosomus commersonii*).
Black sucker (*Hypentelium nigricans*).
Smallmouth buffalofish (*Ictiobus bubalus*).
Common buffalofish (*Ictiobus cyprinella*).
Black buffalofish (*Ictiobus urus*).
THE MINNOWS AND CARPS (CYPRINIDÆ):
Carp (*Cyprinus carpio*).
THE HERRINGS (CLUPEIDÆ):
Skipjack (*Pomolobus chrysochloris*).
THE PIKES AND PICKERELS (ESOCIDÆ):
Pike (*Esox lucius*).
Pickerel (*Esox reticulatus*).

THE BASSES, SUNFISHES, AND CRAPPIES (CENTRARCHIDÆ):
Crappie (*Pomoxis annularis*).
Rock bass, red-eye, goggle-eye (*Ambloplites rupestris*).
Warmouth, goggle-eye (*Chænobryttus gulosus*).
Largemouth black bass (*Micropterus salmoides*).
Smallmouth black bass (*Micropterus dolomieu*).
Bluegill sunfish (*Lepomis incisor*).
Other sunfishes, chiefly *Eupomotis gibbosus*.
THE PERCHES (PERCIDÆ):
Yellow perch, ring perch (*Perca flavescens*).
THE SEA BASSES (SERRANIDÆ):
White bass (*Roccus chrysops*).
Yellow bass (*Marone interrupta*).
THE CROAKERS (SCIÆNIDÆ):
Fresh-water drum, lake sheepshead (*Aplodinotus grunniens*).

SUMMARIZED STATEMENT OF DISTRIBUTION.

The following table shows the number of fish and eggs actually distributed during the fiscal year 1918, or, in other words, the output of the hatcheries, with all losses in transportation deducted:

SUMMARY, BY SPECIES, OF THE DISTRIBUTION OF FISH AND FISH EGGS DURING THE FISCAL YEAR ENDED JUNE 30, 1918.

Species.	Eggs.	Fry.	Fingerlings, yearlings, and adults.	Total.
Catfish			12,733,330	12,733,330
Carp		3,250,000	1,660,941	4,910,941
Buffalofish		28,260,000	2,417,052	30,677,052
Shad		52,543,900		52,543,900
River herring		100,000	3,700,000	3,800,000
Whitefish	75,540,000	408,492,000		484,032,000
Lake herring (cisco)		65,130,000		65,130,000
Silver salmon		980,300	10,534,115	11,514,415
Chinook salmon	17,574,900	6,028,920	63,176,244	86,780,064
Sockeye salmon	13,000,000	38,137,000	45,599,785	96,736,785
Humpback salmon		5,193,065	3,754,000	8,947,065
Chum salmon		9,892,145		9,892,145
Steelhead salmon	1,570,000	172,000	7,022,488	8,764,488
Rainbow trout	1,139,250	22,000	1,654,477	2,815,727
Atlantic salmon		2,577,000	671	2,577,671
Landlocked salmon	478,000	306,395	87,837	872,232
Blackspotted trout	1,090,000	3,821,000	1,878,500	6,789,500
Loch Levan trout			56,000	56,000
Lake trout	21,718,000	39,599,200	226,797	61,543,997
Brook trout	378,175	3,876,265	7,882,668	12,137,108
Sunapee trout			7,372	7,372
Smelt		1,218,750		1,218,750
Pike and pickerel			106,408	106,408
Fresh-water drum			83,473	83,473
Crappie			2,905,812	2,905,812
Largemouth black bass		283,500	970,020	1,253,520
Smallmouth black bass		172,500	155,674	328,174
Rock bass			83,055	83,055
Warmouth bass			9,220	9,220
Sunfish			1,644,558	1,644,558
Pike perch	14,560,000	56,000,000	1,954	70,561,954
Yellow perch		182,899,000	459,282	183,358,282
White perch		2,900,000		2,900,000
White bass			47,261	47,261
Striped bass		14,349,000		14,349,000
Mackerel		4,648,000		4,648,000
Cod		77,659,000		77,659,000
Pollock		233,700,000		233,700,000
Haddock		17,830,000		17,830,000
Winter flounder		2,455,371,000		2,455,371,000
Miscellaneous fishes			100,200	100,200
Lobster		66,680,000	5,700	66,685,700
Total	147,048,325	3,782,091,940	168,964,894	4,098,105,159

Allotments of Fish and Eggs to State Fish Commissions, Fiscal Year 1918.

[Eggs are indicated by an asterisk (*); fry are indicated by a dagger (†); all others are fingerlings and adults.]

State and species.	Number.
California: Chinook salmon	*14,321,900
Connecticut:	
Black bass	515
Catfish	750
Crappie	1,500
Sunfish	2,400
Illinois:	
Black bass	825
Catfish	12,200
Crappie	21,850
Lake trout	*100,000
Pike and pickerel	688
Sunfish	9,370
White bass	2,665
Whitefish	*5,000,000
Yellow perch	2,575
Iowa:	
Brook trout	*50,000
Lake trout	*50,000
Rainbow trout	*94,000
Kentucky:	
Brook trout	600
Pike perch	†2,400,000
Rainbow trout	1,600
Maine:	
Brook trout	*100,000
Lake trout	*100,000
Landlocked salmon	*378,000
Maryland:	
Catfish	180
Crappie	200
Smallmouth bass	88
Massachusetts: Pike perch	*5,000,000
Michigan: Lake trout	*2,550,000
Minnesota:	
Lake trout	*300,000
Steelhead salmon	*50,000
Montana:	
Black-spotted trout	*300,000
Black bass	1,400
Catfish	3,000
Rainbow trout	*300,000
Sunfish	100
Nebraska: Rainbow trout	16,000
Nevada:	
Black-spotted trout	*50,000
Rainbow trout	*50,000
New Hampshire:	
Lake trout	*100,000
Pike perch	*2,000,000
Whitefish	*500,000
New Jersey:	
Black bass	200
Landlocked salmon	*25,000
New Jersey—Continued.	
Rainbow trout	*50,000
Steelhead salmon	*50,000
New York:	
Lake trout	*11,766,000
Landlocked salmon	*50,000
Steelhead salmon	*400,000
Whitefish	*15,000,000
Ohio: Lake trout	*700,000
Oklahoma:	
Rock bass	1,550
Sunfish	1,550
Yellow perch	†10,000 100
Oregon:	
Blueback salmon	*3,000,000
Brook trout	36,000
Chinook salmon	*3,150,000
Steelhead salmon	*750,000
Pennsylvania: Whitefish	*38,280,000
Rhode Island:	
Brook trout	*50,000 20,000
Smallmouth bass	690
South Dakota:	
Black bass	1,050
Brook trout	6,000
Catfish	12,300
Crappie	2,200
Sunfish	5,100
Tennessee:	
Brook trout	*25,000
Rainbow trout	*100,000
Vermont:	
Lake trout	*300,000
Landlocked salmon	*10,000
Pike perch	*7,056,000
Steelhead salmon	*50,000
Washington:	
Black-spotted trout	*200,000
Lake trout	*300,000
Wisconsin:	
Black bass	3,425
Catfish	900
Crappie	1,200
Lake trout	*5,402,000
Whitefish	*15,000,000
Wyoming:	
Black-spotted trout	*200,000
Rainbow trout	*50,000
Steelhead salmon	*50,000
Total	*133,307,900 †2,410,000 170,771

Shipments of Fish and Eggs to Canal Zone and Foreign Countries, Fiscal Year 1918.

[Eggs are indicated by an asterisk (*); all others are fingerlings and yearlings.]

Country and species.	Number.
Canada:	
Sockeye salmon	*10,000,000
Japan:	
Chinook salmon	*100,000
Rainbow trout	*100,000
Mexico:	
Black bass	750
Yellow perch	200
Canal Zone:	
Black bass	1,000
Carp	1,875
Catfish	3,000
Sunfish	2,000
Total	*10,200,000 8,825

DETAILS OF OUTPUT FOR 1918.

The following table shows the work of the different stations in 1918, the period of operation, and the eggs and fish furnished by each station for distribution. It will be noted that transfers of fish and eggs from station to station are frequent. Such transfers are made in the interest of economy and convenience where the shipments consist of eggs, and give advantageous distribution centers in the case of young fish.

STATIONS OPERATED AND THE OUTPUT OF EACH FOR THE FISCAL YEAR 1918.

[NOTE.—See explanations of this table on p. 15.]

Station and period of operation.	Species.	Eggs.	Fry.	Fingerlings, yearlings, and adults.	Total.
Afognak, Alaska:[a]					
Entire year	Sockeye salmon	13,000,000	18,650,000	14,610,000	46,260,000
	Humpback salmon		1,326,000		1,326,000
Seal Bay, Alaska—					
Aug.-Sept.	Sockeye salmon		2,712,000		2,712,000
	Humpback salmon		800,000		800,000
Atchafalaya, La.:					
Mar.-Apr.	Buffalo fish		28,260,000		28,260,000
Baton Rouge, La.—					
Apr.-May	Largemouth black bass			7,150	7,150
	Buffalo fish			9,800	9,800
	Carp			8,550	8,550
	Catfish			11,225	11,225
	Crappie			30,600	30,600
	Drum			3,175	3,175
	Miscellaneous			50,425	50,425
	Sunfish			113,600	113,600
	White bass			2,700	2,700
Baird, Calif.:					
Entire year	Chinook salmon			2,760,000	2,760,000
Battle Creek, Calif.—					
Entire year	do	760,000		4,050,500	4,810,500
Hornbrook, Calif.[b]—					
Entire year	do	275,900			275,900
Mill Creek, Calif.—					
Entire year	do	13,386,000		3,878,900	17,264,900
Baker Lake, Wash.:					
Entire year	Sockeye salmon		1,125,000	9,205,000	10,330,000
	Chinook salmon			7,500	7,500
	Silver salmon		440,000	1,850,750	2,290,750
Birdsview, Wash.[c]—					
Entire year	Sockeye salmon			114,275	114,275
	Chinook salmon			320,860	320,860
	Chum salmon		47,400		47,400
	Humpback salmon			2,915,000	2,915,000
	Silver salmon			1,322,000	1,322,000
	Steelhead salmon	270,000		1,589,500	1,859,500
Brinnon, Wash.—					
Entire year	do			129,000	129,000
Darrington, Wash.—					
Entire year	Chinook salmon		69,468		69,468
	Chum salmon		76,600		76,600
	Humpback salmon		116,891		116,891
	Silver salmon		192,800		192,800
	Steelhead salmon			150,000	150,000
Day Creek, Wash.—					
Entire year	Chinook salmon			14,000	14,000
	Chum salmon		23,000		23,000
	Steelhead salmon		43,000		43,000
Duckabush, Wash.—					
Entire year	Chum salmon		5,233,795		5,233,795
	Humpback salmon		446,840		446,840
	Silver salmon			77,465	77,465
	Steelhead salmon			422,020	422,020
Illabott Creek, Wash.—					
Entire year	Chinook salmon		115,750		115,750
	Chum salmon		1,841,000		1,841,000
	Humpback salmon		434,100		434,100
	Silver salmon		139,500		139,500
	Steelhead salmon			418,100	418,100

STATIONS OPERATED AND THE OUTPUT OF EACH FOR THE FISCAL YEAR 1918—Contd.

[NOTE.—See explanations of this table on p. 15.]

Station and period of operation.	Species.	Eggs.	Fry.	Fingerlings, yearlings, and adults.	Total.
Baker Lake, Wash.—Con.					
Quilcene, Wash.—					
Entire year	Chum salmon		2,670,350		2,670,350
	Humpback salmon		1,135,000	770,000	1,905,000
	Silver salmon			366,000	366,000
	Steelhead salmon			284,000	284,000
Sultan, Wash.[d]					
Entire year	Chinook salmon			68,700	68,700
	Humpback salmon			51,000	51,000
	Silver salmon			3,228,900	3,228,900
	Steelhead salmon	50,000	60,000	490,000	600,000
Berkshire, Mass.:					
Entire year	Brook trout		50,500	481,400	531,900
	Rainbow trout			11,050	11,050
	Steelhead salmon			6,600	6,600
Boothbay Harbor, Me.:					
Entire year	Flounder		1,231,559,000		1,231,559,000
	Lobster		66,680,000	6,000	66,686,000
Bozeman, Mont.:[e]					
Entire year	Blackspotted trout		1,668,000	30,000	1,698,000
	Brook trout			746,650	746,650
	Rainbow trout	875,000		131,000	1,006,000
	Steelhead salmon			18,000	18,000
Yellowstone Park, Wyo.—					
July–June	Blackspotted trout	1,090,000	1,975,000		3,065,000
Bryans Point, Md.:[f]					
Apr.–May	Alewife		100,000		100,000
	Shad		36,309,800		36,309,800
	Yellow perch		139,329,000		139,329,000
Cape Vincent, N. Y.:[g]					
Entire year	Brook trout		711,000		711,000
	Lake herring		65,130,000		65,130,000
	Lake trout		7,876,629		7,876,629
	Rainbow trout		10,000		10,000
	Whitefish	5,500,000	27,482,000		32,982,000
	Yellow perch		37,750,000		37,750,000
Central Station, Washington, D. C.:					
Entire year	Largemouth black bass			50	50
	Brook trout			8,000	8,000
	Humpback salmon			18,000	18,000
	Shad		750,000		750,000
	Sunfish			150	150
	Whitefish		750,000		750,000
Clackamas, Oreg.:					
Entire year	Brook trout			165,620	165,620
	Chinook salmon	3,000	2,000,000	9,299,400	11,302,400
	Rainbow trout			178,280	178,280
	Silver salmon			18,800	18,800
	Steelhead salmon			68,465	68,465
Applegate, Oreg.—					
Entire year[h]	Chinook salmon			36,750	36,750
	Silver salmon			300,100	300,100
	Steelhead salmon	1,250,000		1,991,700	3,241,700
Big White Salmon, Wash.—					
Entire year	Chinook salmon		1,500,000	18,960,357	20,460,357
Little White Salmon, Wash.—					
Entire year	....do	3,150,000	500,000	21,611,277	25,261,277
Rogue River, Oreg.—					
Entire year	Black spotted trout			11,500	11,500
	Chinook salmon			864,000	864,000
	Silver salmon			66,400	66,400
	Steelhead salmon			819,000	819,000
Upper Clackamas, Oreg.—					
Entire year	Chinook salmon		1,843,700	1,084,000	2,927,700
	Rainbow trout			17,699	17,699
	Silver salmon		8,000		8,000
	Steelhead salmon			493,000	493,000
Astoria, Oreg.—					
July	Shad		932,000		932,000
St. Helens, Oreg.—					
July, May–June	....do		8,100,450		8,100,450
Willamette, Oreg.—					
July, May–June	....do		3,592,650		3,592,650

STATIONS OPERATED AND THE OUTPUT OF EACH FOR THE FISCAL YEAR 1918—Contd.

[NOTE.—See explanations of this table on p. 15.]

Station and period of operation.	Species.	Eggs.	Fry.	Fingerlings, yearlings, and adults.	Total.
Cold Springs, Ga.: Entire year	Largemouth black bass			223,237	223,237
	Catfish			16,550	16,550
	Sunfish			61,130	61,130
Milltown, Ga.— Apr.–May	Largemouth black bass			73,500	73,500
Craig Brook, Me.: Entire year	Atlantic salmon		2,577,000	671	2,577,671
	Brook trout		517,000	84,700	601,700
	Humpback salmon		934,235		934,235
	Landlocked salmon		82,460		82,460
Duluth, Minn.: Entire year	Brook trout		172,000		172,000
	Lake trout	600,000	13,240,000	60,000	13,900,000
	Pike perch		4,000,000		4,000,000
	Whitefish		19,260,000		19,260,000
Edenton, N. C.: Entire year	Largemouth black bass		29,000	21,815	50,815
	Shad		2,859,000		2,859,000
	Sunfish			6,100	6,100
	Yellow perch			230	230
Weldon, N. C.— Apr.–May	Striped bass		14,349,000		14,349,000
Erwin, Tenn.: Entire year	Largemouth black bass		20,500	990	21,490
	Brook trout	25,000		107,000	132,000
	Carp			165	165
	Rainbow trout			346,275	346,275
	Rock bass			35,700	35,700
	Smallmouth black bass		1,000	4,105	5,105
	Sunfish			7,200	7,200
Fairport, Iowa: Entire year	Largemouth black bass			12,097	12,097
	Buffalofish			84,398	84,398
	Carp			57,645	57,645
	Catfish			145,394	145,394
	Crappie			82,375	82,375
	Drum			47	47
	Pike perch			270	270
	Pike and pickerel			301	301
	Sunfish			34,602	34,602
	White bass			211	211
	Yellow perch			50	50
	Miscellaneous			175	175
New Boston, Ill.— Aug.–Nov	Largemouth black bass			26,286	26,286
	Buffalofish			89,683	89,683
	Carp			67,795	67,795
	Catfish			190,810	190,810
	Crappie			61,487	61,487
	Drum			726	726
	Pike perch			84	84
	Pike and pickerel			219	219
	Rock bass			167	167
	Sunfish			60,044	60,044
	White bass			17,494	17,494
	Yellow perch			83	83
	Miscellaneous			29,005	29,005
Red Wing, Minn.— Sept	Carp			600	600
	Catfish			162,750	162,750
	Crappie			9,990	9,990
	Pike perch			40	40
	Pike and pickerel			275	275
	Smallmouth black bass			2,345	2,345
	Sunfish			9,490	9,490
	Yellow perch			2,500	2,500
	Miscellaneous			2,060	2,060
Black River, Ark.— Oct.–Dec	Largemouth black bass			1,914	1,914
	Buffalofish			4,212	4,212
	Carp			60	60
	Catfish			642	642
	Crappie			10,185	10,185
	Pike and Pickerel			1,159	1,159
	Sunfish			7,890	7,890
	White bass			281	281
	Yellow perch			82	82
	Miscellaneous			995	995
Lake Pepin, Minn.— Oct	Carp			85	85
	Catfish			2,250	2,250
	Pike and pickerel			260	260
	Miscellaneous			140	140

STATIONS OPERATED AND THE OUTPUT OF EACH FOR THE FISCAL YEAR 1918—Contd.

[NOTE.—See explanations of this table on p. 15.]

Station and period of operation.	Species.	Eggs.	Fry.	Fingerlings, yearlings, and adults.	Total.
Gloucester, Mass.:					
Entire year	Cod		72,940,000		72,940,000
	Flounder		180,530,000		180,530,000
	Haddock		17,830,000		17,830,000
	Pollock		233,700,000		233,700,000
Green Lake, Me.:					
Entire year	Brook trout		782,200		782,200
	Lake trout			76,000	76,000
	Landlocked salmon	278,000	179,937		457,937
	Smelt		1,218,750		1,218,750
Grand Lake Stream, Me.—[k]					
Entire year	Lake trout		23,570		23,570
	Landlocked salmon	200,000	45,000	65,150	310,150
	White perch		2,900,000		2,900,000
Homer, Minn.:					
Entire year	Largemouth black bass			38,250	38,250
	Buffalofish			30,214	30,214
	Carp			55,791	55,791
	Catfish			2,340,113	2,340,113
	Crappie			1,276,475	1,276,475
	Pike perch			1,360	1,360
	Pike and pickerel			46,266	46,266
	Rock bass			532	532
	Sunfish			437,339	437,339
	White bass			7,320	7,320
	Yellow perch			348,628	348,628
La Crosse, Wis.:					
Entire year	Largemouth black bass			25,395	25,395
	Brook trout			235,000	235,000
	Buffalofish			44,800	44,800
	Carp			175,150	175,150
	Catfish			3,086,300	3,086,300
	Crappie			255,980	255,980
	Drum			1,250	1,250
	Pike perch			200	200
	Pike and pickerel			17,605	17,605
	Rainbow trout			66,000	66,000
	Rock bass			236	236
	Sunfish			234,990	234,990
	White bass			730	730
	Yellow perch			48,325	48,325
Leadville, Colo.: [l]					
Entire year	Blackspotted trout			1,577,000	1,577,000
	Brook trout	275,000		3,716,000	3,991,000
	Lake trout			50,000	50,000
	Loch Leven trout			56,000	56,000
	Rainbow trout			160,200	160,200
Louisville, Ky.:					
Entire year	Largemouth black bass			6,000	6,000
	Brook trout			600	600
	Crappie			2,150	2,150
	Pike perch		2,800,000		2,800,000
	Rainbow trout			9,600	9,600
	Rock bass			9,550	9,550
	Smallmouth black bass			5,750	5,750
	Sunfish			14,900	14,900
Mammoth Spring, Ark.: [m]					
Entire year	Largemouth black bass			1,722	1,722
	Rock bass			8,600	8,600
Friar Point, Miss.:					
July–Dec	Largemouth black bass			21,009	21,009
	Catfish			2,970	2,970
	Crappie			12,860	12,860
	Rock bass			4,055	4,055
	Sunfish			115,925	115,925
Manchester, Iowa: [n]					
Entire year	Brook trout	3,175		113,925	117,100
	Crappie			400	400
	Rainbow trout	164,250		90,200	254,450
	Rock bass			2,225	2,225
	Smallmouth black bass			995	995
Bellevue, Iowa—					
July–Dec	Largemouth black bass			136,900	136,900
	Buffalofish			1,862,700	1,862,700
	Carp			1,192,400	1,192,400
	Catfish			4,132,780	4,132,780
	Crappie			835,250	835,250
	Drum			1,075	1,075
	Pike and pickerel			32,028	32,028
	River herring			3,270,000	3,270,000
	Sunfish			241,420	241,420

STATIONS OPERATED AND THE OUTPUT OF EACH FOR THE FISCAL YEAR 1918—Contd.

[NOTE.—See explanations of this table on p. 15.]

Station and period of operation.	Species.	Eggs.	Fry.	Fingerlings, yearlings, and adults.	Total.
Manchester, Iowa—Con.					
Bellevue, Iowa—Con.					
July-Dec.	Warmouth bass			7,710	7,710
	White bass			18,500	18,500
	Yellow perch			19,480	19,480
	Miscellaneous			17,400	17,400
North McGregor, Iowa—					
July-Dec.	Largemouth black bass			75,370	75,370
	Buffalofish			219,445	219,445
	Carp			30,100	30,100
	Catfish			2,509,600	2,509,600
	Crappie			212,760	212,760
	Drum			61,000	61,000
	Pike and pickerel			8,295	8,295
	River herring			430,000	430,000
	Sunfish			45,835	45,835
	Warmouth bass			260	260
	White bass			25	25
	Yellow perch			13,675	13,675
Meredosia, Ill.: o					
Entire year	Largemouth black bass			21,053	21,053
	Buffalofish			71,800	71,800
	Carp			72,600	72,600
	Catfish			134,096	134,096
	Crappie			111,500	111,500
	Drum			16,200	16,200
	Rock bass			950	950
	Smallmouth black bass			88	88
	Sunfish			92,700	92,700
	Yellow perch			26,100	26,100
Nashua, N. H.:					
Entire year	Brook trout			481,400	481,400
	Landlocked salmon			6,400	6,400
	Rainbow trout			81,000	81,000
	Smallmouth black bass		30,000	3,200	33,200
Neosho, Mo.: p					
Entire year	Largemouth black bass			16,325	16,325
	Crappie			9,000	9,000
	Rainbow trout	100,000		41,908	141,908
	Rock bass			13,240	13,240
	Smallmouth black bass			3,535	3,535
	Sunfish			45,748	45,748
	Yellow perch		20,000	164	20,164
Northville, Mich.: q					
Entire year	Brook trout		534,000	51,750	585,750
	Lake trout	21,118,000			21,118,000
	Rainbow trout		12,000	53,000	65,000
	Smallmouth black bass		99,000	135,300	234,300
	Steelhead salmon		46,000		46,000
Charlevoix, Mich.—					
Nov.-June	Lake trout		17,900,000		17,900,000
	Whitefish		32,000,000		32,000,000
Detroit, Mich.—					
Nov.-May	Pike perch		1,100,000		1,100,000
	Whitefish	15,260,000	103,000,000		118,260,000
Orangeburg, S. C.:					
Entire year	Largemouth black bass			141,217	141,217
	Sunfish			32,330	32,330
Put in Bay, Ohio: r					
Entire year	Carp		3,250,000		3,250,000
	Lake trout		593,000		593,000
	Pike perch		28,100,000		28,100,000
	Whitefish	54,780,000	226,000,000		280,780,000
Quinault, Wash.:					
Entire year	Sockeye salmon		2,500,000	3,386,010	5,886,010
	Chinook salmon			220,000	220,000
	Silver salmon		200,000	3,303,700	3,503,700
St. Johnsbury, Vt.:					
Entire year	Brook trout	75,000	930,000	196,584	1,201,584
	Lake trout		6,000	1,722	7,722
	Landlocked salmon			5,767	5,767
	Rainbow trout			300	300
	Smallmouth black bass			3,801	3,801
	Steelhead salmon		23,000	27,498	50,498
	Sunapee trout			7,372	7,372
Holden, Vt.—					
Entire year	Brook trout		258,500	22,504	281,004
	Lake trout		10,000		10,000
	Landlocked salmon			10,520	10,520
	Steelhead salmon			35,605	35,605

STATIONS OPERATED AND THE OUTPUT OF EACH FOR THE FISCAL YEAR 1918—Contd.

[NOTE.—See explanations of this table below.]

Station and period of operation.	Species.	Eggs.	Fry.	Fingerlings, yearlings, and adults.	Total.
St. Johnsbury, Vt.—Con.					
Swanton, Vt.—					
Apr.–May	Pike perch	14,560,000	20,000,000		34,560,000
	Yellow perch		5,800,000		5,800,000
Saratoga, Wyo: *s*					
Entire year	Blackspotted trout			57,000	57,000
	Brook trout			520,000	520,000
	Rainbow trout			104,000	104,000
	Steelhead salmon			80,000	80,000
Spearfish, S. Dak.:					
Entire year	Blackspotted trout		196,000		196,000
	Brook trout			699,425	699,425
	Lake trout			39,075	39,075
	Rainbow trout			30,690	30,690
Springville, Utah: *t*					
Entire year	Brook trout			4,500	4,500
Tupelo, Miss.:					
Entire year	Largemouth black bass		234,000	111,910	345,910
	Crappie			650	650
	Sunfish			75,200	75,200
	Warmouth bass			1,250	1,250
White Sulphur Springs, W. Va.:					
Entire year	Brook trout			276,610	276,610
	Rainbow trout			108,400	108,400
	Smallmouth black bass		34,000	2,050	36,050
Woods Hole, Mass.:					
Entire year	Cod		4,719,000		4,719,000
	Flounder		1,043,282,000		1,043,282,000
	Mackerel		4,648,000		4,648,000
Wytheville, Va: *u*					
Entire year	Largemouth black bass			16,275	16,275
	Brook trout			33,000	33,000
	Rainbow trout			227,505	227,505
	Rock bass			9,600	9,600
	Smallmouth black bass		10,000	2,020	12,020
	Sunfish			10,950	10,950
Yes Bay, Alaska:					
Entire year	Sockeye salmon		13,150,000	18,284,500	31,434,500
Gross output		147,048,325	3,782,241,640	169,068,014	4,098,357,979
Loss in transit			149,700	103,120	252,820
Net output		147,048,325	3,782,091,940	168,964,894	4,098,105,159

NOTES REFER TO REFERENCE CHARACTERS IN PRECEDING TABLE.

For convenience in handling, transfers were made as follows:

a Afognak to Quinault, 5,000,000 sockeye salmon eggs.
b Hornbrook to Clackamas, 154,000 rainbow-trout eggs.
c Birdsview to Craig Brook, 1,000,000; to Central Station, 25,000 humpback-salmon eggs; to Charlevoix, 25,000; to Spearfish, 50,000 steelhead-salmon eggs.
d Sultan to Saratoga, 50,000 steelhead-salmon eggs.
e Bozeman to Rogue River, 50,000; to Leadville, 100,000 rainbow-trout eggs.
f Bryans Point to Central Station, 2,340,000 yellow-perch eggs; 994,000 shad eggs.
g Cape Vincent to Central Station, 500,000 whitefish eggs; to Green Lake, 25,000 lake-trout eggs.
h Applegate to St. Johnsbury, 100,000; to Holden, 50,000; to Green Lake, 50,000; to Northville, 50,000; to Rogue River, 250,000; to Clackamas, 40,000 steelhead-salmon eggs.
i Duluth to Spearfish, 50,000; to Cape Vincent, 2,500,000 lake-trout eggs.
j Erwin to Cold Springs, 2,000; to Friar Point, 8,900 rock bass; to Wytheville, 3,000 sunfish fingerlings.
k Grand Lake Stream to Nashua, 20,000; to Craig Brook, 100,000; to St. Johnsbury, 15,000 landlocked-salmon eggs; to Swanton, 3,500,000 white-perch eggs.
l Leadville to Clackamas, 200,000; to Bozeman, 272,000; to La Crosse, 300,000 brook-trout eggs.
m Mammoth Spring to Tupelo, 7,684 rock-bass fingerlings.
n Manchester to La Crosse, 76,000; to Northville, 86,000; to Cape Vincent, 50,000; to Nashua, 75,000 rainbow-trout eggs.
o Meredosia to Neosha, 1,200 catfish fingerlings.
p Neosha to Meredosia, 5,000 rock bass; to Erwin, 181,000 rainbow-trout eggs.
q Northville to Duluth, 5,000,000; to Cape Vincent, 14,100,000; to Put in Bay, 1,400,000; to Green Lake, 100,000; to St. Johnsbury, 50,000; to Leadville, 50,000 lake-trout eggs.
r Put in Bay to Duluth, 23,000,000; to Detroit, 158,520,000; to Alpena, 32,200,000; to Central Station, 1,800,000 whitefish eggs; to Louisville, 2,500,000 pike-perch eggs.
s Saratoga to Neosho, 25,000 rainbow-trout eggs.
t Springville to Leadville, 200,000 rainbow-trout eggs.
u Wytheville to Bellevue, 5,000 rock bass; to White Sulphur Springs, 150,000; to Nashua, 100,000; to Northville, 100,000; to Neosho, 20,000; to Willow Brook Trout Co., 150,000 rainbow-trout eggs.

The eggs hatched at the main stations listed in the foregoing table are in many cases obtained from auxiliary sources, usually temporary stations occupied during the season only or, in some instances, mere camps which are shifted from year to year. In the Great Lakes and off the New England coast collections are made by the Bureau's vessels or boats in favorable localities. The following temporary stations and collecting points furnished eggs of the given species for the main hatcheries during 1918.

LIST OF EGG-COLLECTING STATIONS, FISCAL YEAR 1918.

Station.	Period of operation.	Species handled.
Afognak, Alaska:		
Uganak, Alaska	August	Sockeye salmon.
Boothbay Harbor, Me.:		
Portland, Me	July and August	Lobster.
Bozeman, Mont.:		
Meadow Creek, Mont	March–June	Rainbow trout.
Clear Creek, Wyo	July–August	Blackspotted trout.
Columbine Creek, Wyo	July	Do.
Cub Creek, Wyo	July–August	Do.
Lake Creek, Wyo	July–September, June	Do.
Soda Butte, Wyo	June	Do.
Cape Vincent, N. Y.:		
Amherst Island, Canada	October–November	Lake trout.
Bay of Quinte, Canada	November–December	Whitefish.
Chaumont, N. Y	do	Lake herring, whitefish.
Fair Haven, N. Y	November	Do.
Green Bay, N. Y	April	Yellow perch.
Henderson Harbor, N. Y	November	Lake herring.
Old Forge, N. Y	do	Whitefish.
Pigeon Island, Canada	November–December	Lake trout.
Pope Mills, N. Y	April	Pike perch.
Sodus Bay, N. Y	November–December	Lake herring.
South Bay, Canada	do	Whitefish.
Stony Island, N. Y	October–November	Lake trout.
Three Mile Bay, N. Y	November–December	Lake herring, whitefish.
Duluth, Minn.:		
Grand Marais, Minn	October–November	Lake trout.
Isle Royale, Mich	do	Lake trout, whitefish.
Marquette, Mich	do	Do.
Munising, Mich	do	Do.
Ontonagon, Mich	do	Do.
Portage, Mich	do	Do.
Leadville, Colo.:		
Annex-Antero Lakes, Colo	May and June	Blackspotted trout.
Crystal Lake, Colo	November	Brook trout.
Engelbrecht Lakes, Colo	October–November	Do.
Musgrove Lakes, Colo	do	Do.
Seven Lakes, Colo	June	Blackspotted trout.
Station Lakes, Colo	October–December	Brook trout.
Turquoise Lake, Colo	do	Do.
Woodland Park, Colo	October–November	Do.
Northville, Mich.:		
Belle Isle, Mich	do	Whitefish.
Beulah, Mich	November	Do.
Cheboygan, Mich	October–November	Lake trout.
Detour, Mich	do	Do.
Fairport, Mich	do	Do.
Frankfort, Mich	December	Whitefish.
Leland, Mich	November–December	Lake trout, whitefish.
Manistique, Mich	October–November	Do.
Naubinway, Mich	November	Whitefish.
Northport, Mich	November–December	Lake trout, whitefish.
St. Ignace, Mich	October–November	Lake trout.
St. Joseph, Mich	October	Do.
Scotts Point, Mich	November	Whitefish.
Put in Bay, Ohio:		
Catawba Island, Ohio	November–December	Do.
Kellys Island, Ohio	do	Do.
Middle Bass, Ohio	do	Do.
Monroe, Mich	November	Do.
North Bass, Ohio	November and April	Whitefish, pike perch.
Port Clinton, Ohio	do	Do.
Toledo, Ohio	November, April, and June	Whitefish, pike perch, carp.

LIST OF EGG-COLLECTING STATIONS, FISCAL YEAR 1918—Continued.

Station.	Period of operation.	Species handled.
St. Johnsbury, Vt.:		
Darling Pond, Vt	July–November	Brook trout.
Lake Mitchell, Vt	September, December	Do.
Spearfish, S. Dak.:		
Schmidt Ranch, S. Dak	October–December	Do.
Sand Creek, Wyo	October–January	Do.
Springville, Utah:		
Fish Lake, Utah	October–November, April, and May	Brook and rainbow trout.
Strawberry Reservoir, Utah	June	Blackspotted trout.
Woods Hole, Mass.:		
Hadley Harbor, Mass	March	Flounder.
Menemsha, Mass	do	Do.
Quissett, Mass	March and April	Do.
Waquoit, Mass	January–March	Cod, flounder.
Wickford, R. I	March and April	Flounder.

DISTRIBUTION OF FISH AND EGGS, BY STATES, WATERS, AND SPECIES, DURING THE FISCAL YEAR 1918.

On the pages following is shown in detail the distribution of fish eggs, fry, fingerlings, yearlings, and adults, by species, by States and municipalities, alphabetically arranged, and by waters, for the fiscal year ended June 30, 1918.

The distribution was composed largely of fingerlings, yearlings, and adults, though quite a number of eggs and fry of some species were distributed. In succeeding pages where figures are preceded by an asterisk (*) they indicate an egg distribution; if preceded by a dagger (†), a fry distribution. All other enumerations represent fingerlings, yearlings, and adults.

Distribution of fish and eggs, fiscal year 1918.

CATFISH.

Disposition.	Number.	Disposition.	Number.
Alabama:		California: Mecca, Cottonwood Pond	250
Abbeville, Kirkland Pond	1,200	Colorado:	
Capps, Oak Log Lake	600	Bovina, Poorman's pond	250
Poor Creek	600	Colorado Springs, Bates Lake	200
Clanton, Mill Spring Pond	200	Denver, Webb's pond	200
Cusseta, Lumpkin Creek	600	Falcon, Big Spring Pond	250
Headland, Abby Creek	900	Homestead Pond	500
Brackin's pond (A)	300	Grand Junction, Grand River	65
Brackin's pond (B)	300	Redland Creek	90
McLenny Pond	600	Welsh Creek	65
Todd Shingel Mill Pond	300	Las Animas, Adobe Lake	500
Murpheys, West Choctawhatchie River	900	Montrose, Rouse's ponds	750
Salem, Little Uchee Creek	1,500	Paonia, Water Cress Lake	500
Arizona:		Ramah, Kernes Pond	250
Elgin, Double Pond	200	Connecticut:	
Globe, Roosevelt Lake	3,200	East Haddam, Joshua Pond	750
Holbrook, Mormon Lake	750	Winsted, Doolittle Pond	150
Peoria, Dysart's pond	200	Shepard Pond	150
Perkinsville, Verde River	750	Georgia:	
Pinto, Turberville's pond	250	College Park, Hathcock's pond	100
San Simon, Darsey's pond	200	Comer, Lake View	600
Winslow, Chevelon Creek	750	Sorrells's pond	400
Arkansas:		Watson Mill Pond	400
Black Rock, Black River	a 294	Conyers, Peek Pond	200
Browns Lake, Black River	a 33	Covington, Willow Lake	200
Gravette, White's pond	75	Crawfordville, Ogeechee River	800
Manson, Black River	a 315	Dawson, Browns Mill Pond	200
Prairie Grove, Combs's pond	100	Douglasville, Eason's pond	600
		Durand, Lake Martha	100

a Rescued from overflowed lands and restored to original waters.

Distribution of fish and eggs, fiscal year 1918—Continued.

CATFISH—Continued.

Disposition.	Number.
Georgia—Continued.	
Gainesville, Vicker's pond	100
Jasper, Mill Creek	150
Loganville, Garrett's pond	200
Watson's pond	200
Lumpkin, Sand Branch Pond	200
McDonough, Lowe's pond	600
Meldean, Mossy Creek	200
Monroe, Adams Pond	200
Nacoochee, Nacoochee River	200
Newborn, Evergreen Pond	200
Sharpsburg, Pitman's pond	300
Temple, Little Tallapoosa River	900
Roberson's pond	600
Thomson, Little River	400
One Mile Pond	200
Tignall, Gully's pond	300
Illinois:	
Apple River, Apple River, North Branch	400
Blanding, Mississippi River	a 123,080
Carbondale, Lake Blanche	200
Freeport, Waters of Illinois	10,200
Galena Junction, Mississippi River	a 403,500
Hanover, Mississippi River	a 314,500
Hillsboro, Hope's pond	450
Joliet, Hickory Creek	300
Lane, Mammossor Lake	800
Meredosia, Illinois River	a 121,120
Naperville, DuPage River, West Branch	1,000
New Boston, Mississippi River	a 190,810
Nora, Apple River, East Branch	400
Pana, Sider's pond	450
Scales Mound, Mill Creek	400
Indiana:	
Amo, Ray's pond	200
Angola, Loon Lake	400
Dupont, Marble Valley Pond	100
Eaton, Mississinewa River	1,000
Edinburg, Sugar Creek	300
Mishawaka, St. Joseph River	400
Worthington, Smith's pond	100
Iowa:	
Bellevue, Mississippi River	a 2,000,900
Clayton, Mississippi River	a 239,600
Coin, Whipp Lake	100
Cresco, Iowa River	600
Turkey River	600
Fairport, Mississippi River	a 145,394
Green Island, Mississippi River	a 1,156,000
Guttenburg, Mississippi River	a 10,000
Iowa Falls, Iowa River	4,400
Keswick, Willow Pond	100
Manchester, Maquoketa River	3,330
North McGregor, Mississippi River	a 1,040,850
Orient, Rexall Lake	100
Ottumwa, Lock Lamore Pond	200
Perry, North Raccoon River	1,000
Raccoon River	2,200
Pleasant Creek, Mississippi River	a 75,000
Quarry, Iowa River	5,500
Sny Magill, Mississippi River	a 300,000
Yellow River, Mississippi River	a 200,000
Kansas:	
Codell, Stockwood Pond	100
Hutchinson, Reformatory Pond	300
Topeka, Berry Creek	200
Kentucky:	
Demossville, Licking River	300
Franklin, Harris Pond	100
Leak Pond	100
Sewell Pond	100
Lancaster, Bratton's pond	200
Lebanon, McEby's pond	200
Morganfield, Flournoy's pond	100
Paris, Lindsay Pond	100
Rowletts, Lester's pond	100
Louisiana:	
Baton Rouge—	
Amite River	a 50
Mississippi River	a 11,175
Maryland:	
Baltimore, State Ponds	180
Keedysville, Antietam Creek, Tributary of	400
Millers, Hoover's pond	200
Massachusetts:	
Clinton, Coachlace Pond	150
Lake Wauschacum, East	150
Little Pond	150
Mossy Pond	150
South Meadow Pond	150
West Lake	150
Fitchburg, Whalom Lake	450
Milford, North Pond	300
State Line, Leete Pond	150
Michigan:	
Allenville, Lake Brevort	500
Covington, Parents Lake	600
Cressey, Crooked Lake	500
Holton, Hemlock Lake	200
Homer, Homer Mill Pond	300
Jackson, Browns Lake	200
Jackson Mill Pond	300
Lake George, Lake George	400
Richland, Long Lake	300
Vanderbilt, Round Lake	300
Minnesota:	
Homer, Mississippi River	a 2,333,113
Lake Pepin, Mississippi River	a 2,250
Red Wing, Mississippi River	a 52,750
Mississippi:	
Corinth, Hinton's pond	200
Falkner, Jackson's pond	125
Stonewall, Cubley's pond	160
Waynesboro, Limestone Creek Pond	360
Missouri:	
Chadwick, Cook Pond	100
Iantha, Lily View Pond	100
Mindenmines, Starr Lake	350
Seligman, Roller's pond	100
Thayer, Oldbricht's pond	100
Viburnum, Acorn Pond	150
West Plains, Swarton Lake	200
Twin Ponds	100
Montana:	
Billings, Yellowstone River	700
Malta, Bish Brothers Pond	200
Nelson Lake	300
Miles City, Yellowstone River	3,000
Nebraska:	
Ashby, Barr's pond	300
Nebraska City, Pine Ridge Pond	900
Rushville, Big Bend Pond	300
Stromsburg, Happy Hollow Pond	300
Verdon, Franenfelder's pond	200
Harden's pond	300
New Hampshire:	
Concord, Contoocook River	150
North Walpole, Connecticut River	450
New Jersey:	
Burlington, Delaware River	900
Penns Grove, Layton Lake	1,200
New Mexico:	
Capitan, Deane's pond	200
Deming, Willow Loch Pond	400
Folsom, Dry Cimarron River	750
French, French Lake	750
Kenna, Hendrix's pond	200
Roswell, Golf Lake	200
Lenox Lake	100
New York:	
Addison, Canisteo River	800
Altimont, Thompson Lake	300
Avon, Horseshoe Pond	400

a Rescued from overflowed lands and restored to original waters.

Distribution of fish and eggs, fiscal year 1918—Continued.

CATFISH—Continued.

Disposition.	Number.
New York—Continued.	
Cohocton, Cohocton River	500
Hamilton, Chenango Canal	500
Horseheads, Shappell's pond	100
Newark, Coffey Lake	500
Poultney, Hill View Pond	100
Schenevus, Schenevus Pond	300
Worcester, Schenevus Creek	300
North Carolina: Pee Dee, Blewett Falls Lake	900
North Dakota:	
Engleville, Lone Tree Lake	750
Forbes, Spring Lake	500
St. John, Lakes of Rolette County	2,000
Ohio:	
Albany, Stotts's pond	100
Wood's pond	200
Belleville, Clear Fork Creek	300
Cutnaw Lake	200
Gatton Lake	200
Honey Creek	200
Lily Pond	100
Mahood Pond	300
Plank Dam Creek	100
Bethel, McCarty's pond	100
Brinkhaven, Dry Fork Pond	200
Carey, Carey Association Pond	200
Cridersville, Moyer's pond	100
Lake View, Indian Lake	500
Milford, Water Lily Pond	100
Salem, Mahoning Lake	100
Utica, Milbrook Pond	200
Zoar, Tuscarawas River	200
Oklahoma:	
Asher, Merrill's pond	200
Bessie, Harms's pond	150
Byars, Alexander's pond	200
Cushing, Dunkin Lake	150
Glencoe, Murphy's pond	150
Goteba, Spring Lake	150
Grandfield, Porter's pond	200
Guthrie, Sunnyside Lake	200
Haskell, Willow Grove Pond	200
Lawton, Lake Milliken	150
Mangum, Trotter's pond	200
Moore, Brand's pond	200
Morris, Morris Gin Pond	200
Pawhuska, Jim Creek Lake	200
Sand Creek	400
Perry, City Lake	800
Pittsburg, Allen Lakes	200
Roosevelt, Hallinen Pond	300
Stillwater, Lakeview Pond	300
Parks's pond	600
Tangier, Turkey Creek	300
Twin Lake	100
Walter, Johnson's pond	150
Lokey's pond	150
Woodward, Allen Lake	200
Excelsior Ranch Lake	100
Pennsylvania:	
Altoona, Juniata River	6,000
Canton, Lake Nepahwin	400
Chicora, Frederick's pond	200
Clarks Summit, Mill Pond	400
Collegeville, Perkiomen Creek	800
Cressey, Ten Mile Run	300
Denver, Cocalico Creek	400
East Greenville, Perkiomen Creek	600
Fallen Timber, Slate Run	600
Green Lane, Perkiomen Creek	400
Hendricks, Perkiomen Creek	400
Hosensack, Hosensack Creek	400
Kratz, Perkiomen Creek	400
Landisville, Big Chiques Creek	600
Pennsylvania—Continued.	
Lititz, Bricker's pond	200
Conestoga Creek	800
McLeans, Perkiomen Creek	400
Manheim, Chickies Creek	600
Mifflinburg, Knauer Pond	600
Oaks, Perkiomen Creek	800
Pennsburg, Perkiomen Creek	1,200
Pequea, Susquehanna River	400
Perkiomenville, Perkiomen Creek	400
Preston Park, Potato Creek Pond	300
Red Hill, Perkiomen Creek	400
Royersford, French Creek	400
Mill Dam Pond	200
Pigeon Creek	200
Stony Run	400
Spring Mount, Perkiomen Creek	800
West Grove, Lynch's pond	200
Zeiglersville, Perkiomen Creek	800
South Dakota:	
Colome, Hughes's pond	300
Flandreau, Big Sioux River	400
Philip, Fairview Pond	200
Gale Dam Pond	200
Sioux City, waters of South Dakota	12,300
Spearfish, Sunnyside Pond	150
Wessington Springs, Tofflemeir's lake	200
Tennessee:	
Ashland City, Sycamore Creek	500
Rugby Road, High Pond	100
Shelbyville, Duck River	250
Virginia:	
Bedford, Rucker's pond	75
Byllesby, Buck Dam Pond	150
Byllesby Pond	150
Cripple Creek	150
Elk Creek	150
New River	150
Farmville, Lower Pond	150
Front Royal, Barnet's pond	300
Gate City, Wid Pond	75
Lorton, Occoquan Creek	225
Orange, Rapidan River	225
Wytheville, Reed Creek	150
West Virginia:	
Albright, Little Sandy Creek	500
Berkeley Springs, Sleepy Creek	1,000
Bramwell, Bluestone River	146
Cascade, Falls Run	500
Terra Alta, Goff's pond	250
Youghiogheny River	500
Wisconsin:	
Alma, State fish commission	900
Bagley, Mississippi River	[a] 30,000
Bay City, Mississippi River	[a] 110,000
Beaver Dam, Beaver Dam Lake	1,500
Beaver Dam River	1,000
Genoa, Mississippi River	[a] 295,000
Glen Haven, Mississippi River	[a] 20,000
Helenville, Borck Reul Lake	500
Johnson Creek, Rock River	600
La Crosse, Mississippi River	[a] 2,787,200
North Freedom, Mirror Lake	500
Prairie du Chien, Mississippi River	[a] 267,700
Woodyard, Mississippi River	[a] 110,000
Wyalusing, Mississippi River	[a] 246,000
Wyoming:	
Aladdin, Pearson's pond	300
Parkman, Cooper Lake	300
Canal Zone:	
Gatun Lake, Gatun Lake	3,000
Total [b]	12,733,330

[a] Rescued from overflowed lands and restored to original waters.
[b] Exclusive of 2,150 lost in transit.

Distribution of fish and eggs, fiscal year 1918—Continued.

CARP.

Disposition.	Number.	Disposition.	Number.
Arkansas:		Minnesota:	
Black Rock, Black River	a 50	Homer, Mississippi River	a 55,791
Manson, Black River	a 10	Lake Pepin, Mississippi River	a 85
Illinois:		Red Wing, Mississippi River	a 490
Blanding, Mississippi River	a 8,000	Ohio:	
Galena Junction, Mississippi River	a 59,500	Port Clinton, Portage River	†1,500,000
Hanover, Mississippi River	a 20,000	Put in Bay, Lake Erie	†1,750,000
Meredosia, Illinois River	a 72,600	South Dakota: Murdo, Holland's pond	100
New Boston, Mississippi River	a 67,795	Virginia: Ceres, Walker Pond	165
Iowa:		Wisconsin:	
Bellevue, Mississippi River	a 764,425	Bay City, Mississippi River	a 110
Clayton, Mississippi River	a 300	Genoa, Mississippi River	a 21,000
Fairport, Mississippi River	a 57,645	La Crosse, Mississippi River	a 154,150
Green Island, Mississippi River	a 313,500	Prairie du Chien, Mississippi River	a 400
North McGregor, Mississippi River	a 18,600	Canal Zone: Gatun Lake, Gatun Lake	1,875
Pleasant Creek, Mississippi River	a 25,000		
Sny Magill, Mississippi River	a 10,800	Total	†3,250,000
Louisiana: Baton Rouge, Mississippi River	a 8,550		1,660,941

BUFFALOFISH.

Arizona: Globe, Roosevelt Lake	420	Louisiana:	
Arkansas:		Atchafalaya, Atchafalaya River	†4,500,000
Black Rock, Black River	a 2,463	Bayou Tein	†6,000,000
Browns Lake, Black River	a 75	Gulchreaux Slough	†8,000,000
Manson, Black River	a 1,670	Mississippi River	a 9,800
Illinois:		Opelousas Bay	†9,760,000
Blanding, Mississippi River	a 14,000	Minnesota:	
Galena Junction, Mississippi River	a 101,000	Clearbrook, Olson Lake	200
Galesburg, Glenwood Lake	125	Homer, Mississippi River	a 30,214
Hanover, Mississippi River	a 35,500	Virginia: White Stone, Antipoison River	200
Meredosia, Illinois River	a 71,675	Wisconsin:	
New Boston, Mississippi River	a 89,683	Genoa, Mississippi River	a 25,000
Iowa:		La Crosse, Mississippi River	a 19,600
Bellevue, Mississippi River	a 1,526,500	Prairie du Chien, Mississippi River	a 200
Fairport, Mississippi River	a 84,398		
Green Island, Mississippi River	a 85,500	Total	†28,260,000
Guttenburg, Mississippi River	a 25		2,417,052
North McGregor, Mississippi River	a 218,800		
Pleasant Green, Mississippi River	a 100,000		

SHAD.

District of Columbia: Highway Bridge, Potomac River	†750,000	Oregon:	
Maryland:		Astoria, Youngs River	†932,000
Broad Creek, Potomac River	†4,631,600	Oregon City, Willamette River	†1,532,650
Moxley Bar, Potomac River	†613,000	St. Helens, Willamette River	†8,100,450
Piscataway Creek, Potomac River	†8,722,000	Willamette Falls, Willamette River	†2,060,000
Pomonkey Creek, Potomac River	†3,310,700	Virginia:	
Swan Creek, Potomac River	†3,704,200	Dogue Creek, Potomac River	†5,504,700
Tent Landing, Potomac River	†779,600	Mount Vernon, Potomac River	†1,866,500
North Carolina: Edenton, Albermarle Sound	†2,859,000	Occoquan, Potomac River	†6,150,600
		Pohick, Potomac River	†1,026,900
		Total	†52,543,900

RIVER HERRING.

Illinois:		Maryland: Bryans Point, Potomac River	†100,000
Galena Junction, Mississippi River	a 1,260,000		
Hanover, Mississippi River	a 660,000	Total	†100,000
Iowa:			a 3,700,000
Bellevue, Mississippi River	a 1,350,000		
North McGregor, Mississippi River	a 430,000		

a Rescued from overflowed lands and restored to original waters.

Distribution of fish and eggs, fiscal year 1918—Continued.

WHITEFISH.

Disposition.	Number.
Illinois: Springfield, State fish commission	*5,000,000
Michigan:	
Alpena, Lake Huron	†4,800,000
Antrim City, Grand Traverse Bay	†5,000,000
Belle Isle, Detroit River	†46,000,000
Cathead Reef, Lake Michigan	†3,000,000
Charlevoix, Pine River	†15,000,000
Cheboygan, Hammonds Bay	†600,000
Saddle Bag Bay	†600,000
Crystall Falls, Anderson Lake	†300,000
Detroit, Aquarium	*260,000
Fighting Island, Detroit River	†10,000,000
Fort Wayne, Detroit River	†5,000,000
Gilchrist, Lake Michigan	†2,500,000
Gould City, Lake Michigan	†2,500,000
Grace Harbor, Lake Superior	†750,000
Grassy Island, Detroit River	†10,000,000
Indian River, Bush Lake	†600,000
Iron River, Pickerel Lake	†400,000
Sunset Lake	†400,000
McCargoes Cove, Lake Superior	†1,550,000
McLeods Channel, Lake Superior	†2,000,000
Manistique, Lake Michigan	†2,000,000
Marquette, Lake Superior	†4,375,000
New Richmond, Lake Michigan	†1,200,000
Point Fishery, Detroit River	†4,000,000
St. Ignace, Lake Huron	†1,200,000
Mackinaw Straits	†2,000,000
Tobins Harbor, Lake Superior	†500,000
Willis Fishery, Detroit River	†19,000,000
Wrights Island, Lake Superior	†1,250,000
Minnesota:	
Duluth, Lake Superior	†10,000
Grand Portage, Lake Superior	†825,000
Turner, Mud Lake	†300,000
Wanless, Harrison Lake	†300,000
Twin Lakes	†300,000
Montana: Somers, applicant	*500,000
New Hampshire: Warren, State fish commission	*500,000
New York:	
Albany, State fish commission	*15,000,000
Allan Otty Shoal, Lake Ontario	†100,000
Bear Point, Lake Ontario	†3,632,000
Fair Haven, Lake Ontario	†25,000
Fox Island, Lake Ontario	†500,000
Fullers Bay, Lake Ontario	†3,400,000
Grenadier Island, Lake Ontario	†5,800,000
Long Lake West, Little Tupper Lake	*1,000,000
Niagara Falls, Niagara River, lower	†1,000,000
Plattsburg, Lake Champlain	†1,000,000
Pleasant Lake, Longfellow Lake	†25,000
Pleasant Lake	†25,000
Point Peninsula, Lake Ontario	†2,500,000
Port Henry, Lake Champlain	†500,000
Sodus Point, Lake Ontario	†125,000
Stony Point, Lake Ontario	†3,400,000
Three Mile Bay, Lake Ontario	†50,000
Tibbetts Point, Lake Ontario	†4,400,000
Watkins, Seneca Lake	†750,000
Wilson Bay, Lake Ontario	†1,000,000
Ohio:	
Catawba Island, Lake Erie	†11,000,000
Isle St. George, Lake Erie	†65,000,000
Kellys Island, Lake Erie	†10,000,000
Locust Point, Lake Erie	†10,000,000
Middle Bass, Lake Erie	†40,000,000
Port Clinton, Lake Erie	†40,000,000
Put in Bay, Lake Erie	†50,000,000
Toledo, Lake Erie	†10,000,000
Pennsylvania:	
Erie, State fish commission	*4,280,000
Union City, State fish commission	*34,000,000
Wisconsin:	
Amnicon River, Lake Superior	†6,000,000
Sheboygan, State fish commission	*15,000,000
Total	*75,540,000 †408,492,000

LAKE HERRING (CISCO).

New York:	
Allan Otty Shoal, Lake Ontario	†3,960,000
Bear Point, Lake Ontario	†3,000,000
Charity Shoal, Lake Ontario	†4,140,000
Fair Haven, Lake Ontario	†5,000,000
Fox Island, Lake Ontario	†13,080,000
Henderson Harbor, Lake Ontario	†2,500,000
Point Peninsula, Lake Ontario	†4,080,000
New York—Continued.	
Sodus Point, Lake Ontario	†5,000,000
Syony Point, Lake Ontario	†4,080,000
Three Mile Bay, Lake Ontario	†7,450,000
Tibbetts Point, Lake Ontario	†6,420,000
Wilson Bay, Lake Ontario	†6,420,000
Total	†65,130,000

SILVER SALMON.

Oregon:	
Applegate, Applegate Creek	300,100
Clackamas, Clackamas River	18,800
Trail, Rogue River	66,400
Upper Clackamas, Clackamas River	†8,000
Washington:	
Baker Lake, Baker Lake	†440,000 1,850,750
Birdsview, Day Creek	45,000
Grandy Creek	1,032,000
Phinney Creek	245,000
Brinnon, Walcotts Slough	77,465
Washington—Continued.	
Darrington, Bennetts Slough	†192,800
Illabott, Illabott Creek	†179,500
Quilcene, Big Quilcene River	286,000
Little Quilcene River	80,000
Quinault, Falls Creek	†200,000 1,797,000
Quinault Lake	1,506,700
Sultan, Elwell Creek	3,228,900
Total	†980,300 10,534,115

Distribution of fish and eggs, fiscal year 1918—Continued.

CHINOOK SALMON.

Disposition.	Number.	Disposition.	Number.
California:		Washington—Continued.	
Baird, McCloud River	2,760,000	Birdsview, Grandy Creek	270,860
Battle Creek, Battle Creek	4,050,500	Phinney Creek	30,000
Mill Creek, Mill Creek	3,878,900	Skagit River	20,000
Sisson, State fish commission	*14,321,900	Darrington, Bennetts Slough	†51,500
New York: Ithaca, applicant	*3,000	Sauk River	†17,970
Oregon:		Day Creek, Day Creek	14,000
Applegate, Applegate Creek	36,750	Illabott, Illabott Creek	†115,750
Bonneville, State fish commission	*3,150,000	Little White Salmon, Little White Salmon River	†500,000 21,611,277
Clackamas, Clackamas River	†2,000,000 9,299,400	Quinault, Falls Creek	66,600
River Mill, Clackamas River	†1,843,700 1,084,000	Quinault Lake	153,400
Trail, Rogue River	864,000	Sultan, Elwell Creek	21,500
Washington:		Skyomish River	47,200
Baker Lake, Baker Lake	7,500	Japan: Kobe, Japanese Government	*100,000
Big White Salmon, Big White Salmon River	†1,500,000 18,960,357	Total	*17,574,900 †6,028,920 63,176,244

SOCKEYE SALMON.

Alaska:		Washington—Continued.	
Afognak, Hatchery Creek	†6,200,000	Birdsview, Grandy Creek	114,275
Letnik Lake	†12,450,000 14,610,000	Quinault, Quinault Lake	†2,500,000 3,386,010
Seal Bay Creek, Seal Bay	†2,712,000	British Columbia: Agassiz, Canadian Government	*10,000,000
Yes Bay, Hatchery Creek	†13,150,000		
Lake McDonald	18,284,500		
Oregon: Bonneville, State fish commission	*3,000,000	Total	*13,000,000 †38,137,000 45,599,785
Washington:			
Baker Lake, Baker Lake	†1,125,000 9,205,000		

HUMPBACK SALMON.

Alaska:		Washington—Continued.	
Afognak, Letnik Bay	†675,000	Darrington, Bennetts Slough	†57,000
Letnik River	†651,000	Sauk River	†59,890
Seal Bay Creek, Seal Harbor	†800,000	Duckabush, Duckabush River	†446,840
Maine:		Illabott, Illabott Creek	†434,100
Dennysville, Dennys River	†618,000	Quilcene, Big Quilcene River	†600,000 770,000
Pembroke, Pembroke River	†316,235	Sultan, Elwell Creek	51,000
New Jersey: Mays Landing, Egg River	18,000		
Washington:		Total	†5,193,065 3,754,000
Birdsview, Grandy Creek	3,915,000		
Brinnon, Wolcotts Slough	†535,000		

CHUM SALMON.

Washington:		Washington—Continued.	
Birdsview, Grandy Creek	†47,400	Illabott, Illabott Creek	†1,841,000
Brinnon, Wolcotts Slough	†1,663,820	Quilcene, Big Quilcene River	†1,425,000
Darrington, Bennetts Slough	†76,600	Little Quilcene River	†825,350
Day Creek, Day Creek	†23,000		
Duckabush, Duckabush River	†3,989,975	Total	†9,892,145

STEELHEAD SALMON.

Massachusetts:		New Hampshire:	
Athol, Tom Swamp Pond	1,000	Conicut, Lake Tarleton	6,000
Hartsville, Green River	1,500	Newport, Butternut Pond	†3,000
Harmon Brook	1,100	Cold Pond	†5,000
Kingston, Brookdale Brook	*100,000	Pike, Lake Tarleton	11,000
Michigan:		New Jersey: Hackettstown, State fish commission	*50,000
Aloha, Mullet Lake	†26,000		
Long Lake, Au Sable Lake	†10,000	New York:	
Ossineke, Devil River	†10,000	Albany, State fish commission	*400,000
Minnesota: St. Paul, State fish commission	*50,000	Au Sable Forks, Taylor Pond	5,000
Montana: Whitefish, Whitefish River	10,000	Riverside, Schroon Lake	3,000

Distribution of fish and eggs, fiscal year 1918—Continued.

STEELHEAD SALMON—Continued.

Disposition.	Number.
Oregon:	
Applegate, Applegate Creek	1,991,700
Butte Falls, State fish commission	*750,000
Clackamas, Clackamas River	60,465
Trail, Rogue River	819,000
Upper Clackamas, Clackamas River	493,000
Pennsylvania: Glen Eyre, Lake Giles	*50,000
Vermont:	
Bellows Falls, Saxtons River	3,000
Danville, Joes Pond	348
Hardwick, Nichols Pond	1,000
Holden, Chittenden Dam	23,605
Hyde Park, Lamoille River	1,000
Middlebury, Leicester River	1,000
New Haven River	3,000
Newport, Clyde River	†5,000
Missisquoi River	†5,000
Orleans, Willoughby River	†5,000 1,000
Plainfield, Winooski River	5,000
Randolph, Railway Brook	1,000
Roxbury, State fish commission	*100,000
St. Johnsbury, Sleepers River	350
West Danville, Joes Pond	1,000
Washington:	
Birdsview, Alder Creek	50,000
Day Creek	344,000
Grandy Creek	760,000
Mill Creek	50,000
Phinney Creek	326,000
Vogler's Lake	50,000
Washington—Continued.	
Brinnon, Dusewallips River	129,000
Chico, Valley Tracts Pond	14000
Clallam, Beaver Lake	3,000
Pysht River	5,000
Darrington, Bennetts Slough	150,000
Day Creek, Day Creek	†43,000
Duckabush, Duckabush River	422,320
Illabott, Illabott Creek	418,100
Olympia, Lake Neuwatsel	2,000
Pomeroy, Pataha Creek	3,000
Quilcene, Big Quilcene River	189,000
Little Quilcene River	95,000
Stevenson, Washougal River	3,000
Sultan, Elwell Creek	†60,000 490,000
Wisconsin: Spooner, applicant	*20,000
Wyoming:	
Encampment, Encampment River	18,000
Evenston, Snowden's pond	6,000
Gold Hill Lake, Gold Hill Lake	20,000
Jacks Creek, Jacks Creek	3,000
Pass Creek, Pass Creek	10,000
Saratoga, Cedar Creek	6,000
North Platte River	8,000
Spring Creek	9,000
Sheridan, State fish commission	*50,000
Teton, Phelps Lake	8,000
Total	*1,570,000 †172,000 7,022,488

RAINBOW TROUT.

Alaska:	
Fairbanks, applicant	*25,000
Hames, Mud Lake	*25,000
Alabama: Courtland, Sandy Creek	4,000
Arizona:	
Flagstaff, Mormon Lake	1,000
Holbrook, Show Low Creek	1,000
Silver Lake	1,000
Walnut Spring Pond	1,000
Jerome Junction, Fritsche Lake	500
Portal, Cave Creek	1,500
Safford, Ivy Canyon Creek	1,000
Morijilda Canyon Creek	1,000
Sycamore, Sycamore Creek	1,000
Tucson, 3 C Ranch Pond	1,000
Arkansas:	
Green Forest, Harbert's pond	500
Harrison, Buffalo Creek	1,500
Springdale, Clear Creek	3,000
East Brush Creek	3,000
Hickory Creek	2,000
Spring Creek	3,000
Colorado:	
Antero, Antero Lake	3,000
Aspen, Blue Lake	1,000
Castle Creek	1,500
Fall Creek	2,000
New York Lake	5,000
North American Lake	6,500
Taylor Lake	1,500
Bailey, Entriken Meadow Lake	1,000
Breckenridge, Blue Lake	1,500
Buffalo, Buffalo Creek	1,500
Goose Creek	1,500
Carbondale, Snowmass Creek	4,000
Cassells, Cassells Lake	1,500
Cebolla, Carpenter's pond	1,500
Cebolla Creek	1,500
Gunnison River	1,500
Cimarron, Butte Lake	1,000
Cliff, King's pond	500
Clyde, Bison Creek	1,000
Colorado—Continued.	
Cotopaxi, Lake Creek Lake	2,500
Creede, Rio Grande	2,500
Crossons, Crossons Pond	500
DeBeque, Leon Creek	1,500
Denver, Bear Creek	2,000
Durango, Potato Lake	1,000
Florence, Beaver Creek	2,000
Fort Collins, Big Thompson River	1,500
Cache La Poudre River	3,500
Georgetown, Murry Lake	2,000
Naylor Lake	2,000
Grant, Geneva Creek	2,000
Gunnison, Clarke Creek	1,000
Cottonhurst Creek	1,000
Hayden, Yoast's pond	1,000
LaVeta, Mill Lake	1,000
Leadville, Empire Creek	500
Frying Pan River	2,000
Middle Evergreen Lake	6,000
Loveland, Big Thompson River	1,500
Big Thompson River, North Fork	1,500
Marble, Beaver Lake	1,000
Carbonate Creek	1,000
Crystal River	1,000
Lost Trail Creek	1,000
Yule Creek	1,000
Mineral Hot Springs, Wild Cherry Creek Lake	5,000
Minturn, Gore Creek	1,500
Moffat, Saguache Creek	2,500
Nast, Frying Pan Lake	4,000
Norrie, Savage Lake	4,000
Pitkin, Quartz Creek	1,000
Red Cliff, Eagle River	1,500
Ridgway, Blue Lake	1,500
Ruedi, Ruedi Lake	800
Salida, South Arkansas River	1,500
Shawnee, South Platt River, North Fork	1,500
South Cheyenne, South Cheyenne Creek	1,000

Distribution of fish and eggs, fiscal year 1918—Continued.

RAINBOW TROUT—Continued.

Disposition.	Number.
Colorado—Continued.	
South Platte, South Platte River	1,500
Steamboat Springs, Aqua Frio Lake	1,000
Slide Lake	1,000
Tabernash, Ranch Creek	1,500
Thomasville, Fairview Lake	4,000
Lime Creek	5,000
Little Lime Creek	2,400
Ward, Forest Lake	1,000
Westcliffe, Vanable Lake	1,500
Woodland Park, Northfield Lake	1,500
Connecticut: Simsbury, Eno's pond	600
Georgia:	
La Fayette, Big Spring Pond	2,000
Lakemont, Tiger Creek	3,000
Tiger Creek Pond	2,000
Turpin Creek	3,000
Robertstown, Dukes Creek	4,000
Hiawassee River	3,000
Tiger, Ramey Creek	2,000
Idaho:	
Ashton, Phoenix Ranch Pond	6,000
Drummond, Condah Creek	7,000
Illinois: Chicago, applicant	*1,000
Indiana:	
Crawfordsville, Country Club Lakes	7,000
Mishawaka, Willow Creek	†4,000
Iowa:	
Calmar, Protivin Creek	1,500
Cedar Rapids, applicant	*2,500
Cresco, Bealk Creek	800
Silver Creek	1,200
Lansing, State fish commission	*94,000
North McGregor, Bloody Run	800
Kentucky:	
Glasgow, Fallen Timber Creek	8,000
Harlan, Cumberland River, Martin Fork	1,600
Louisiana:	
Amite, Chappapela Creek	200
Spring Branch	100
Arcola, Spring Branch	100
Kentwood, Line Creek	100
Minden, Orphans Lake	125
Maine:	
Jackman, Crocker Pond	5,000
Portland, Pleasant River	7,000
Maryland:	
Baltimore, Greens Branch	4,000
Myersville, Stotelmyer's pond	300
Massachusetts:	
Foxboro, Lake Neponset	6,000
Greenfield, Stone Brook	1,500
Kingston, applicant	*100,000
Hunts Ponds	300
Lowell, Burgess Pond	3,000
Forge Pond	4,000
Long Pond	4,000
Long-Sought-For-Pond	3,000
Spectacle Pond	3,000
Pittsfield, Morewood Lake	1,000
Secum Brook	1,000
Michigan:	
Graylings, Tilula Lake	300
Montrose, Glenn Lake	10,000
Ravenna, Crockery Creek	5,000
Reed City, Hersey River	12,000
Wingleton, Pere Marquette River	11,000
Minnesota:	
Cedar Brook, Cedar Brook	5,000
Dover, Whitewater Creek	3,000
Preston, Camp Creek	2,000
Forestville Creek, North Branch	1,000
Partridge Creek	2,000
South Branch Creek	1,000
Spring Creek	1,000
Trout Creek	1,000
Watson Creek	1,000
Willow Creek	2,000
Rochester, Washspring Creek	5,000

Disposition.	Number.
Minnesota—Continued.	
Rushford, Enterprise Creek	2,000
Pine Creek	2,000
Rust Creek	2,000
Uodine Creek	2,000
Whitewater Creek	2,000
Wiscoy Creek	2,000
St. Cloud, Little Watab River	5,000
Tamarack, Turtle Lake	4,000
Wadena, Finn Creek	3,000
Missouri:	
Birch Tree, Johnie Hollow Run	2,000
Columbia, Rock Bridge Creek	1,500
Diamond, Banum Branch	500
Lebanon, Ha Ha Tonka Lake	5,000
Montier, Searcy Run	1,500
Neosho, Clear Creek	4,000
Hearrell Branch	126
Hickory Creek	182
Saginaw, Osborn's pond	150
Springfield, Jordan River	585
Steeleville, Westover Creek	2,500
Verona, Spring River	1,000
Montana:	
Anaconda, State fish commission	*300,000
Bozeman, East Rainbow Lake	1,000
Mystic Lake	1,000
West Rainbow Lake	1,000
Butte, applicant	*113,000
Conrad, Barber's pond	1,000
Williams Pond	1,000
Gilman, Sun River, North Fork	10,000
Glacier Park, Boulder Creek	3,000
Gunsight Lake	4,000
St. Marys River, Middle Fork	5,000
Swift Current Creek, Upper	3,000
Havre, Clear Creek	5,000
Joplin, Big Sage Creek	2,000
Lodge Grass, Lodge Grass Creek	16,000
Manhattan, Bull Creek	3,000
Oyler Creek	4,000
Waters Creek	2,000
Marion, Lang Trout Pond	1,000
Norris, South Meadow Creek	20,000
Plentywood, Park Lake	3,000
Troy, applicant	*50,000
Twin Bridges, Wisconsin Lake	2,000
Nebraska:	
Andrews, White River	2,625
Gretna, Niobrara River	16,000
Nevada:	
Elko, Humbolt River	3,000
Verdi, State fish commission	*50,000
New Hampshire:	
Bennington, Moose Brook	4,000
North Branch River	10,000
Canaan, Fales Brook	4,000
Hinkson Brook	5,000
Lakewood, Ossippee Lake	8,000
Lebanon, Mascoma River	4,000
Nashua, Silver Lake	5,000
Newport, Sugar River, South Branch	10,000
Suncook, Boat Meadow Brook	3,000
New Jersey:	
Hackettstown, State fish commission	*50,000
Oak Ridge, Stony Brook Lake	500
New Mexico:	
Carlsbad, Dark Canon Creek	1,000
Carrizozo, Ruidioso River	1,000
Chama, Brazos River	1,000
Canjilon Creek	1,000
Canones Creek	1,000
Chama River	1,000
Chavez Creek	1,000
Rio de Tierra Amarilla	1,000
Rio Nutritis	1,000
Mountainair, Tajique Canyon Creek	1,000
Onava, Bass Lake	2,500
Upper Armstrong Lake	1,000

Distribution of fish and eggs, fiscal year 1918—Continued.

RAINBOW TROUT—Continued.

Disposition.	Number.
New Mexico—Continued.	
Springer, Orchard Spring Pond	500
Taos Junction, Blue Lake	1,000
Tularosa, Indian School Pond	500
New York:	
Ardsley, Nepperhan River	1,250
Benson Mines, Star Lake	4,000
Twin Lakes	3,000
Canaseraga, Windsor Creek	†2,000
Chappaqua, White Birch Pond	200
Elmira, Shepard Creek	4,000
Sing Sing Creek	2,000
Hornell, Big Creek	4,000
Canacadea Creek	4,000
Canisteo River	8,000
Car Valley Brook	3,000
Ithaca, applicant	*3,750
Malone Junction, Salmon River	4,000
North Ilion, Miller Mill Creek	4,000
Purdys, Holmes Lake	2,000
Syracuse, Butternut Creek	4,500
Onondaga Creek	4,500
Tarrytown, Little Mohawk Pond	500
White Plains, Rye Lake	1,250
Wyandanch, Carlls River	1,250
North Carolina:	
Black Mountain, Broad River	3,500
Broad River, Rush Branch	1,400
Grassy Creek	2,100
Swannanoa River, North Fork	10,500
Swannanoa River, Sugar Fork	2,100
Bryson, Kirkland Creek	2,800
Dillard, Big Creek	3,000
Salt Rock Branch	2,000
Satulah Creek	2,000
Shoal Creek	3,000
Slab Cabin Branch	2,000
Wildcat Lake	2,000
Elkin, Church's pond	1,000
Grassy Creek	3,000
Elkland, Brushy Fork Creek	1,000
Elk Creek	1,000
Elk Park, Elk River	7,000
Little Elk Creek	5,000
Farner, Hiawassee River	750
Hendersonville, Maxwell Creek	4,200
Rocky Broad River	11,900
Hickory, Rockett's pond	1,400
Linville, Camp Creek	4,000
Johnson's pond	1,000
Mill Timber Creek	3,000
Upper Toe River	8,000
Wilson Creek	6,000
Montezuma, Chestnut Heights Lake	5,000
Mt. Sterling, Big Creek	4,000
Laurel Creek	6,000
Murphy, Cook Creek	4,900
Wauchesee Creek	3,500
Noland, Andrews Creek	3,500
Bald Creek	3,500
Bear Pen Creek	2,100
Deer Creek	2,800
Horse Cove Creek	2,100
Indian Creek	2,100
Laurel Branch	2,100
Mill Creek	2,100
Noland Creek	3,500
North Wilkesboro, Moravian Creek Pond	700
Reddies River	1,000
Roaring River, Middle Fork	4,200
Roaring River, West Fork	4,200
Old Fort, Catawba River	2,100
Mill Creek	3,500
Pisgah Forest, Davidson River	14,400
Mills River, South Fork	15,000
Shulls Mills, Cane Creek	5,000
Upper Laurel Creek Pond	4,000
North Carolina—Continued.	
Toecane, Byrd's pond	1,000
Byrd and Wilson Creek	3,000
Tryon, Bullings Creek	7,000
Waynesville, Caldwell Fork Creek	4,900
Cataloochee Creek	5,600
Horse Creek	4,200
Indian Creek	5,600
Richland Creek	4,200
Woodys Creek	5,600
West Jefferson, Cranberry Creek	2,500
North Dakota: Halliday, Hans Creek	500
Ohio:	
Castalia, Castalia Trout Run	5,000
Middlefield, Orchard Pond	†3,000 3,000
Ravenna, Cuyahoga River, tributary of	†5,000
Oklahoma:	
Smithville, Mountain Fork	1,600
Spavinaw, Spavinaw Creek	1,600
Strang, Spavinaw Creek	2,500
Wyandotte, Brushy Creek	3,000
Oregon:	
Butterfield, Saunders Lake	5,000
Clackamas, Clackamas River	13,580
Clear Creek, Clear Creek	31,000
Eagle Creek, Eagle Creek	10,000
Oregon City, Molala River	25,000
Upper Clackamas, Clackamas River	17,699
Pennsylvania:	
Altoona, Roaring Spring Creek	600
Benton, Fishing Creek	3,200
Bryn Mawr, Cobbs Creek	4,000
Cowanesque, Purple Brook	200
Cedar Hollow, Valley Creek	4,000
Central, Fishing Creek	3,200
Coles Creek, Fishing Creek	3,200
Edsons, Fishing Creek	3,200
Forks, Fishing Creek	3,200
Gaines Junction, Big Hollow Creek	300
Elk Run, south fork	300
Gal Run	900
Kettle Creek	800
Lick Run	400
Long Run	500
Pine Creek	1,200
Smith Run	300
Spring Brook	300
Spring Run	500
Thompson Hollow Creek	300
Gap, Livingstone Run	4,000
Grass Mere Park, Fishing Creek	3,200
Howellville, Valley Creek	4,000
Ivyland, Pleasant Plains Pond	1,000
Jamison, Fishing Creek	3,200
Johnstown, Alwine Run	900
Benns Creek	1,200
Cold Spring Run	900
Roaring Run	1,200
Salt Lick Run	900
King of Prussia, Trout Creek	2,000
Lancaster, Little Conestoga Creek	5,000
Laubachs, Fishing Creek	3,200
Narvona, Dennis Run	4,000
Little Conestoga Creek	3,000
New Centerville, Trout Creek	2,000
Valley Creek	4,000
New Germantown, Fowlers Run	900
Parkerson River	1,200
Sheaffers Run	600
Norristown, Neilson's pond	1,000
Oak Hall, Blue Spring Run	2,000
Paoli Road, Valley Creek	4,000
Petersburg, Armon Run	600
Massey Run	1,200
Shovers Creek	1,200
Pine Grove Furnace, Fuller Lake	2,000

Distribution of fish and eggs, fiscal year 1918—Continued.

RAINBOW TROUT—Continued.

Disposition.	Number.
Pennsylvania—Continued.	
Plainbrook, Valley Creek	4,000
Pocono Summit, Tobuhanna Creek	1,500
St. Clair, Wolf Creek Pond	3,200
Slatington, Aquashicola Creek	7,000
Big Creek	4,000
Trout Creek	3,000
Wild Creek	4,000
Stillwater, Fishing Creek	3,200
Susquehanna, Canawacta Creek	†3,000
Starrucca Creek	†5,000
Tamaqua, Cold Run	500
Valley Store, Valley Creek	4,000
Warren, Farnsworth Creek	2,400
Wilkes-Barre, Thorn Lake	3,200
Wyalusing, Sugar Run Creek	8,000
Wyalusing Creek	8,000
South Carolina:	
Greenville, Brushy Creek	4,000
Cox Creek	3,000
Hillhorn Creek	3,000
Matthews Creek	4,000
Mills Creek	3,000
Oil Camp Creek	4,000
Saluda River and branches	14,800
Stone's pond	1,000
Terry Creek	3,000
Whitney, Dawson Fork Creek	12,000
South Dakota:	
St. Onge, False Bottom Creek	2,000
Spearfish, Camp No. 2 Lakes	115
Tennessee:	
Austral, Gee Creek	9,000
Del Rio, Big Creek, Dry Fork	5,000
Doe, Doe Creek	6,000
Elkmont, Jakes Creek	3,000
Laurel Creek	3,000
Little River	12,000
Pigeon River	12,000
Pigeon River, West Prong	12,000
State fish commission	*100,000
Erwin, Rocky Fork Creek	5,000
Etowah, Lost Creek	750
Hampton, Spring Lake	75
McFarland, Coker Creek	1,000
Morristown, Crystal Lake	1,000
Roan Mountain, Doe River	5,000
Spring City, Hinch's pond	1,000
Tullahoma, Hurricane Creek	5,000
Utah:	
Murray, applicant	*25,000
Ogden, Burton's pond	1,000
Winter's ponds	2,500
Virginia:	
Abingdon, White Top Creek	15,000
Appomattox, Appomattox River	400
Blackstone, Daniels's pond	500
Bonsacks, Beechwood Place Pond	500
Boone Mill, Maggodee Creek	2,000
Byllesby, Brushy Creek	2,000
Taylor Run	2,000
Cripple Creek, Rosebaum's pond	500
Kimballton, Big Stony Creek	1,000
Marion, Staley Creek	1,500
Mount Jackson, Big Stony Creek	600
New Castle, Sinking Creek	1,200
News Ferry, Birch Creek	500
Paint Bank, Paint Bank Creek	250
Pamplin, Sacony Creek	500
Pearisburg, Nobusiness Creek	2,000
Pembroke, Laurel Creek	2,000
Richmond, Harnish's pond	1,000
Roanoke, Prater Creek	7,000
Rugby, Cabin Creek	1,000
Rural Retreat, Cripple Creek	500
Salem, McAfee Run	2,000
Tazewell, Little Creek	2,000
Roaring Fork Creek	2,000
Troutville, North Fork Branch	500
Tye River, Davis Creek	4,000
Piney River	4,000
Shoe Creek	4,000
Virginia—Continued.	
Waynesboro, Pratt Creek	1,200
Wytheville, Cove Creek, North Fork	1,000
Little Creek	2,000
Stony Fork Creek	1,000
Tates Run	165
Washington:	
Aberdeen, Black Creek	3,000
Dalazine Creek	3,000
Johns River	3,000
Mooney Creek	3,000
Neushka Creek	4,000
Newman Creek	3,000
Salmon Creek	3,000
Vesta Creek	2,000
Widerind Creek	3,000
Chewelah, Waits Lake	5,000
Colville, applicant	*50,000
Olympia, Red Creek	3,000
Stevenson, Blue Lake	5,000
Columbia River, tributary of	7,200
Tacoma, Spanaway Creek	4,500
Vancouver, Battle Ground Lake	4,000
Lewis River	19,000
Washougal River	19,000
West Virginia:	
Amblersburg, Salt Lick Pond	200
Clay Run, Tygarts Valley River	1,800
Richwood, Cherry River, South Fork	1,500
Sewell, Glade Creek	600
Manns Creek	1,800
Shepherdstown, Town Run	2,400
Sleepy Creek, Meadow Branch	2,000
Spangler, Elk River	1,200
Elkwater Creek	1,500
Wisconsin:	
Baldwin, Cady Creek	3,000
Nyes Creek	1,000
Timberlake Spring Brook	1,000
Willow Creek, East Fork	2,000
Blue Mounds, Austin Creek	400
Bohris Creek	400
Bloeys Creek	400
McKinney Creek	400
Ruste Creek	400
Blue River, Gorman Branch	1,200
Cashton, Schriener Creek	1,000
Chippewa Falls, Big Drywood Creek	400
Duncan Creek	1,200
Little Drywood Creek	400
Paint Creek	1,200
Cylon, Willow River, South Fork	1,000
Deer Park, Willow River	5,000
Dodgeville, Flint Creek	800
Eleva, Monson Creek	1,200
Elkhart Lake, Crystal Lake	600
Hayward, Namakagon River	5,000
Narrow Creek	2,000
La Farge, Bear Creek	800
Goose Creek	400
Indian Creek	400
Jug Creek	400
Otter Creek	800
Warner Creek	800
Wiester Creek	800
River Falls, Kinnickinick River	8,000
St. Croix Falls, St. Croix River	4,000
Sauk City, Sugar Grove Creek	800
Somerset, Power Pond	3,000
Spooner, Crystal Creek	1,600
Waukesha, Nillians Creek	800
Westby, Alderman Creek	1,000
Dahl Creek	1,000
Dauve Creek	1,000
Ellefson Creek	1,000
Esofea Creek	1,000
Freming Creek	1,000
Hagen Creek	1,000
Haugen Creek	1,000
Hansen Creek	1,000
Helge Larson Creek	1,000
Helgeson Creek	1,000

Distribution of fish and eggs, fiscal year 1918—Continued.

RAINBOW TROUT—Continued.

Disposition.	Number.
Wisconsin—Continued.	
Westby, Helseth Creek	1,000
Hollien Creek	1,000
Homsted Creek	1,000
Larson Creek	1,000
Laughers Creek	1,000
Moller Creek	1,000
Nelson Creek	1,000
Norbo Creek	1,000
North Bad Ax River	1,000
Olson Creek	1,000
Rentz Creek	1,000
Sandbakken Creek	1,000
Sanding Creek	1,000
Seas Branch	1,000
Shannon Creek	1,000
Sletto Creek	1,000
Spring Valley Creek	1,000
Sween Creek	1,000
Swenson Creek	1,000
Tomten Creek	1,000
Twenty Four Valley Creek	1,000
Van Ruden Creek	1,000
Warm Spring Creek	1,000
Woodman, Little Green Creek	800
Wyoming:	
Cody, Blackwater Creek	2,000
Browns Spring Creek	2,000
Eagle Creek	1,000
Goff Creek	3,000
Gunbarrel Creek	2,000
Jim Creek	2,000
Wyoming—Continued.	
Cody, Jones Creek	2,000
Mormon Creek	2,000
Shoshone River and Branches	8,000
Sweetwater Creek	1,000
Encampment, Encampment River	23,000
Evanston, Russell's ponds	8,000
Snowden's pond	3,000
Gold Hill Lake, Gold Hill Lake	20,000
Jacks Creek, Jacks Creek	4,000
Lander, Dinwoodie Creek	1,575
Little Popo Agie River	1,575
Louis Lake	1,050
Lower North Fork River	2,625
Popo Agie River and branches	5,250
Sweetwater River	6,825
Laramie, State fish commission	*50,000
Newcastle, Lower Stockade Creek	3,000
Middle Beaver Creek	3,000
Parkman, Dayton Creek	5,000
Powder River, Eccles Lake	1,050
Rock River, Rock Creek	10,000
Saratoga, Cedar Creek	8,000
Greyhound Lake	10,000
North Platte River	10,000
Spring Creek	8,000
Japan: Kobe, Japanese Government	*100,000
Total [a]	*1,139,250 †22,000 1,654,477

ATLANTIC SALMON.

Maine:	
Brownville, Pleasant River	†600,000
Cherryfield, Narraguagus River	†225,000
Dennysville, Dennys River	†627,000
Grindstone, Mattawamkeag River, East Branch	†375,000
Oakfield, Mattawamkeag River, East Branch	†375,000
Maine—Continued.	
Orland, Orland River	671
Pembroke, Pembroke River	†375,000
Total	†2,577,000 671

LANDLOCKED SALMON.

Maine:	
Bingham, Rowe Pond	†3,000
Bridgeton Junction, Barker Pond	†3,000
Brownfield, Burt Meadow Pond	†3,000
Caribou, State fish commission	*278,000
Cornish, Stanley Pond	†3,000
Dedham, Green Lake	†5,000
Dexter, Main Brook	†10,000
Eagle Lake, Eagle Lake	†10,000
Square Lake	†10,000
East Orland, Toddy Pond	†82,460
Farmington, Big Barnard Pond	†4,000
Bog Pond	†4,000
Long Pond	†6,000
Lower Pond	†6,000
Natanias Pond	†6,000
Tee Pond	†4,000
Forest, Farrar Lake	†5,000
Grand Lake, Grand Lake	†45,000 65,150
Greenville Junction, Sawyer Pond	†3,000
Hartland, Great Moose Lake	†7,500
Island Falls, Mattawamkeag Lake	†4,000
Jackman, Lake Wood	†4,500
Kineo, Moose River	†7,500
Moosehead Lake	†7,500
Roach River	†3,000
Mattocks, Sand Pond	†3,000
Moodys Crossing, Moors Pond	†4,000
Mount Desert Ferry, Morancy Pond	†5,000
Oquossoc, Rangeley Lakes	†8,000
Otis, Green Lake	†3,925
Portage, Portage Lake	†8,000
Maine—Continued.	
South Windham, State fish commission	*100,000
Stockholm, Square Lake	†16,000
Unity, Winnecook Lake	†6,000
New Hampshire:	
Laconia, Winnesquam Lake	4,000
Newport, Crescent Lake	2,400
New Jersey: Hackettstown, State fish commission	*25,000
New York:	
Keepawa, Big Rock Lake	1,000
Lake George, Lake George	3,000
Long Lake West, Doctors Pond	*5,000
Nehasane, Lake Lila	1,000
Warrensburg, State fish commission	*30,000
Pennsylvania: Bellefonte, Sugar Run Lake	*10,000
Vermont:	
Canaan, Big Averill Lake	800
Little Averill Lake	400
Derby Center, Salem Pond	2,367
Greensboro, Caspian Lake	2,000
Holden, Lake Dunmore	1,520
Newport, Seymour Lake	2,000
Orleans, Willoughby Lake	2,000
Readsboro, Newton Pond	200
Roxbury, State fish commission	*10,000
Total [b]	*478,000 †506,395 87,837

[a] Exclusive of 2,640 fingerlings lost in transit.

[b] Exclusive of 1,000 fry lost in transit.

Distribution of fish and eggs, fiscal year 1918—Continued.

BLACKSPOTTED TROUT.

Disposition.	Number.
Alaska: Juneau, applicant	*100,000
Arizona:	
Flagstaff, Oak Creek	47,500
Globe, East Verde Creek	5,000
Pine Creek	5,000
Tonto Creek, West Branch	10,000
Workman Creek	5,000
Sycamore, Sycamore Creek	7,500
Winslow, East Clear Creek	20,000
California: Point Reyes, Olema Creek	*10,000
Colorado:	
Baileys, South Platte River	50,000
Breckenridge, Barton Creek	5,000
Crystal Lake	5,000
Indiana Creek	5,000
McCollough Creek	5,000
North Ten Mile Creek	5,000
Spruce Creek	5,000
Upper Blue River	5,000
Cebolla, East Elk Creek	12,500
Cimarron, Little Cimarron River	20,000
Colorado Springs, Broadmoor Lake	6,000
Cheyenne Lake	4,000
Como, Four Mile Creek	5,000
Creede, Lower Clear Creek	5,000
Rio Grande	10,000
Crested Bluff, East River	20,000
Cripple Creek, Gillett Lake	4,000
Del Norte, Los Pinos Creek	7,500
Denver, Cub Creek	5,000
Dillon, Black Creek	5,000
Durango, Canyon Creek	5,000
Cascade Creek	7,500
Clear Creek	2,500
Dutch Creek	5,000
Hermosa Creek	15,000
Junction Creek	17,500
La Olata River	22,500
Lime Creek	5,000
Needle Creek	5,000
Eldora, Middle Boulder Creek	8,000
Florence, Middle Creek	6,000
South Hardscabble Creek	8,000
Foxton, South Platte River, North Fork	6,000
Fraser, Cabin Creek	5,000
Fraser River	17,000
Ranch Creek	7,000
St. Louis Lake	5,000
Glacier, Glacier Lake	14,000
Granby, Grand River, South Fork	15,000
Strawberry Creek	5,000
Graneros, St. Charles Creek	5,000
Granite, Lake Creek, North Fork	5,000
Lake Creek, South Fork	5,000
Gunnison, Gunnison River	36,000
Hayden, Bunker Creek	5,000
North Hunt Creek	2,500
Poose Creek	5,000
Rough Creek	2,500
Williams River, East Fork	15,500
Hierro, North Beaver Creek	5,000
Hot Sulphur Springs, Beaver Creek	5,000
Howard, Big Cottonwood Creek	5,000
Idaho Springs, Chicago Creek, West Fork	4,000
Vance Creek	4,000
Kremmling, Pass Creek	10,000
Lake City, Gunnison River, Lake Fork	15,000
Lake George, Tarryall Creek	14,000
La Veta, Cuchara Creek	7,500
Leadville, Little Homestead Creek	5,000
Twin Lakes Creek	20,000
Windsor Lake	5,000
Los Pinos Section House, Los Pinos River	5,000
Lyons, Big Thompson River, Middle Fork	6,000
Cabin Creek	8,000
Colorado—Continued.	
Lyons, Fall Creek	6,000
Fox Creek	6,000
North St. Vrain River	10,000
Maddox, South Platte River, North Fork	26,000
Malta, Rock Creek	4,000
Marble, Crystal River	6,000
Lost Trail Creek	4,000
Yule Creek	4,000
Nast, Chatman Lake	4,000
Ohio City, Gold Creek	6,000
Pagosa Springs, Falls Creek	7,500
Four Mile Creek	5,000
Piedra River, Middle Fork	5,000
Quartz Creek	5,000
Sand Creek	5,000
San Juan River, East Fork	5,000
San Juan River, West Fork	5,000
Silver Creek	5,000
Turkey Creek	5,000
Wolf Creek	5,000
Parshall, Grand River, Williams Fork	7,500
Phippsburg, Hunt Creek	15,000
Pine Grove, Platte River	10,000
Pitkin, Quartz Creek	6,000
Pueblo, St. Charles Creek	8,000
Radium, Sheephorn Creek	15,000
Rollinsville, Espy Lake	5,000
Rosemont, East Beaver Creek	14,000
Salida, Bear Creek	5,000
Browns Creek	5,000
Sapinero, Cement Creek	10,000
Curricanti Creek	10,000
Mill Creek	6,000
Ohio Creek	8,000
Sapinero Creek	5,000
Slate River	6,000
Taylor River	10,000
Silverton, South Mineral Creek	5,000
South Fork, Alder Creek	5,000
Elk Creek	5,000
Embargo Creek	7,500
Steamboat Springs, Big Creek Lake	2,500
Gem Lake	2,500
Gold Creek Lake	2,500
Green Creek	2,500
Harrison Creek	4,000
North Fork Lake	2,500
South Fork Lake	2,500
Upper Corral Lake	2,500
Walton Creek, North Fork	4,000
Sunset, Four Mile Creek	6,000
Tabernash, Cabin Creek	15,000
Crooked Creek	5,000
Fraser River	9,000
Pole Creek	5,000
Thomasville, Lime Creek	75,000
Victor, Number Ten Lake	4,000
Walkers Spur, Frying Pan River	20,000
Walsenburg, Huerfano River	5,000
Ward, Beaver Lake	6,000
Brainard Lake	2,000
James Creek	8,000
Long Lake	2,000
Middle St. Vrain River	14,000
Shadow Lake	2,000
South St. Vrain River	6,000
Wray, Matheney Lake	2,000
Robb Lake	2,000
Yampa, Coal Creek	5,000
Middle Hunt Creek	16,500
Watson Creek	2,500
Youman, Big Blue Creek	10,000
Idaho: Soda Springs, Blackfoot River	†7,500
Michigan: Detroit, applicant	*10,000
Montana:	
Anaconda, McCarthy's pond	†20,000
State fish commission	*100,000

Distribution of fish and eggs, fiscal year 1918—Continued.

BLACKSPOTTED TROUT—Continued.

Disposition.	Number.
Montana—Continued.	
Armstrong Spring Creek	†6,000
Avon, Dog Creek	†5,000
Snowshoe Creek	†5,000
Trout Creek	†5,000
Becket, Atherton Creek	†4,000
Belgrade, Cottonwood Creek	†7,500
Pass Creek	†10,000
Belton, Cut Bank Creek	†7,500
Lake McDermott	†2,500
Lake McDonald	†7,500
Red Eagle Lake	†2,500
Two Medicine Lake	†2,500
Big Timber, Blue Creek	†7,500
Boulder River	†16,000
Cayuse Creek	†6,000
Upper Boulder Creek	†10,000
Bozeman, Asbestos Creek	†3,000
Beaver Creek	†3,000
Buffalo Horn Creek	†3,000
Deer Creek	†3,000
East Bear Creek	3,000
Middle Creek	†3,000
Middle Spanish Creek	†3,000
North Spanish Creek	†3,000
Olson Creek	2,000
Sour Dough Creek	†3,000
South Spanish Creek	†3,000
Spring Hill Creek	3,000
Trail Creek	4,000
West Bear Creek	3,000
West Fork Creek, North Branch	†2,000
West Fork Creek, South Branch	†3,000
Butte, applicant	*200,000
Carabella, Miner Creek	†4,000
Miner Lake	†6,000
Rock Creek	†8,000
Chadborn, Bangtail Creek	†6,000
Clyde Park, Cole Creek	†4,000
Rock Creek	†8,000
Corwin Springs, Cedar Creek	†12,000
Cutler Lake	†8,000
Randall Lake	†2,000
Twin Lakes	†4,000
Daileys, Big Creek	†4,000
Daileys Creek	†4,000
Yellowstone River	†6,000
Dillon, French Creek Pond	†5,000
Gardiner, Gardiner River	†8,000
Yellowstone River	†8,000
Glacier Park, Red Eagle Lake	†7,500
Hamilton, Bitter Root River	†2,500
Blodgett Creek	†7,500
Gird Creek	†5,000
Skalkaho Creek	†5,000
Sleeping Child Creek	†5,000
South Willow Creek	†27,500
Lenner, Bonanza Creek	†4,000
Musselshell River, South Fork	†6,000
Lewistown, Cottonwood Creek	†8,000
Judith River, tributaries of	†14,000
Livingston, Alkali Creek	†4,000
Bloom Lake	†10,000
Cayuse Creek	†4,000
Cokedale Creek	†8,000
East Duck Creek	†4,000
Elbow Creek	†12,000
Mortimer Creek	†12,000
Strickland Creek	†12,000
West Duck Creek	†4,000
Yellowstone River	†44,000
Lodge Grass, Lodge Grass Creek	†10,000
Manhattan, Baker Creek	†7,500
Camp Creek	†7,500
Lehman Creek	†7,500
Spring Creek	†5,000
Martinsdale, Musselshell River, North and South Forks	†20,000
Montana—Continued.	
Mission, Mission Creek	†6,000
Missoula, Beaver Creek	†5,000
Big Blackfoot River, North Fork	†7,500
Bitter Root River	†7,500
Blanchard Creek	†7,500
Camas Creek	†5,000
Cottonwood Creek	†7,500
Finley Creek	†7,500
Gold Creek	†7,500
Grant Creek	†7,500
Jocko Creek	†7,500
Johnson Creek	†7,500
Lo Lo Creek	†7,500
Mill Creek	†5,000
Miller Creek	†7,500
Monture Creek	†7,500
Rattlesnake Creek	†7,500
Rock Creek	†7,500
Twinn Creek	†5,000
Mitchell, Big Sheep Creek	†5,000
Park City, Yellowstone River	†20,000
Perma, Burgess Lake	†10,000
Pony, Hanson Lake	†5,000
Pray, Lambert Creek	†4,000
Mill Creek, North Fork	†4,000
Mill Creek, South Fork	†4,000
Simon Creek	†4,000
Strawberry Creek	†2,000
Saltese, Big Sunday Creek	†5,000
Dominion Creek	†5,000
Packer Creek	†7,500
Packer Creek, East Fork	†5,000
Packer Creek, West Fork	†5,000
St. Regis River	†7,500
Silver Creek	†5,000
Sixteen, Dry Creek	†6,000
Spring Creek	†6,000
Soda Butte, Soda Butte Lake	†600,000
Stevensville, Ambrose Creek	†2,500
Bass Creek	†5,000
Bitter Root River, Middle Fork	†2,500
Gold Creek	†2,500
Mill Creek	†5,000
Sawmill Creek	†2,500
Three Mile Creek	†5,000
Thompson Falls, Cabin Creek	†12,000
Taft, Rainy Creek	†5,000
Randolph Creek	†5,000
Townsend, Crow Creek	15,000
Greyson Creek	†5,000
Ray Creek	†5,000
Whitefish, Swift Creek	†20,000
White Suphur Springs, Eagle Creek	†6,000
Eight Mile Creek	†4,000
Four Mile Creek	†8,000
Little Birch Creek	†2,000
Smith River	†8,000
Willow Creek	†4,000
Woods Gulch Creek	†4,000
Wilsall, Crandall Creek	†2,000
Daisy Dean Creek	†2,000
Elk Creek, North Fork	†2,000
Elk Creek, South Fork	†2,000
Flathead River, South Fork	†2,000
Flathead River, Upper	†2,000
Flathead River, West Fork	†2,000
Horse Creek	†2,000
Horse Creek, North	†2,000
Horse Creek, Upper	†2,000
Little Muddy Creek	†2,000
Porcupine Creek	†2,000
Potter Creek	†2,000
Shields River	†8,000
Shields River, South Fork	†2,000
Smith Creek	†2,000
Winston, Beaver Creek	†5,000
Nevada: Ely, State fish commission	*50,000

Distribution of fish and eggs, fiscal year 1918—Continued.

BLACKSPOTTED TROUT—Continued.

Disposition.	Number.
New Mexico:	
Buckman, Frijoles Canon Creek	6,000
Carrizozo, Ruidoso River	12,500
Chama, Brazos River	2,500
Chama River	2,500
Chamita River	2,500
Cimarron, Cimarron Reservoir	7,500
Little Ponil Creek	10,000
Cloudcroft, Monument Canyon Creek	7,500
Scott Able Canyon Creek	7,500
Embudo, Embudo Creek	8,000
Junta Rio Creek	8,000
Rio Pueblo	16,000
Santa Barbara River	16,000
Folsom, Dry Cimarron River	2,500
Trinchara Creek	7,500
Glorietta, Holy Ghost Creek	12,500
Jacks Creek	12,500
Pecos River	7,500
Rito Trita Amarilla	5,000
Winsor Creek	5,000
Jarosa, Costilla River	22,000
Rio Colorado	10,000
Ute Creek	4,000
Las Vegas, Gallinas Creek	10,000
Mora River	5,000
Rio de las Casa	5,000
Perea, Nutria Creek	10,000
Raton, Lake Maloya	6,000
Sugarite Creek	6,000
San Marcial, Nogal Creek	15,000
Santa Fe, Nembe River	8,000
Rio Medio	8,000
Santa Fe River	8,000
Tesuque River	6,000
Taos Junction, Little Rio Grande	2,000
Pot Creek	2,000
Rio Chiquito	2,000
Rio Hondo	4,000
Rio Valecitos	8,000
Taos Creek	8,000
Ute Park, Bitter Creek	8,000
Cimarron River	12,000
Goose Creek	8,000
Red River	20,000
New York: New York, Aquarium	*20,000
Oregon:	
Antelope Lake, Antelope Lake	†7,500
Clackamas, Molalla River	18,000
Estacada, Clackamas River	10,000
Oregon City, Deep Creek	8,000
Mill Creek	18,000
Molalla River	10,000
Trail, Rogue River	11,500
South Dakota:	
Englewood, Box Elder Creek and branches	†14,000
Este Creek	†4,000
Jim Creek	†6,000
Little Elk Creek	†6,000
Piedmont, Little Elk Creek	†6,000
Pringle, Beaver Creek	†5,000
Rapid City, Lower Box Elder Creek	†6,000
Lower Rapid Creek	†6,000
Lower Springs Creek	†6,000
Rapid Creek	†6,000
Rochford, Castle Creek	†5,000
Spearfish, McLaughlin Creek	†6,000
Ralphs Branch	†6,000
Spearfish Creek, Cooper Branch	†6,000
Sturgis, Parker's pond	†2,000
Tilford, Pleasant Willow Pond	†2,000
Washington:	
Aberdeen, East Hoquiam River	7,500
Hoquiam River	7,500
Little North Creek	7,500
North River	7,500
Washington—Continued.	
Aberdeen, Wynooche Creek	7,500
Burlington, State fish commission	*100,000
Colville, State fish commission	*25,000
Cleelum, State fish commission	*25,000
Fisher, Simmons Lake	3,000
Kelso, Coal Creek	20,000
Orting, Miller Pond	5,000
Seattle, Snoqualmie River	*25,000
Spokane, Shelley Lake	†14,000
Stevenson, Little White Salmon River	3,000
Rock Creek	3,000
Wind River	4,000
Tacoma, Bay Lake	4,000
Bergh Creek	2,500
Carney Lake	4,000
Clear Lake	4,000
Clover Creek	5,000
Crescent Lake	4,000
La Camas Creek	2,500
Little Mashell River	4,000
Little Ohap Creek	2,500
Mashell River	5,000
Minter Creek	4,000
Orting Lake	4,000
South Creek	3,000
Spanaway Creek	4,000
Tanwax Creek	5,000
Vancouver, Big Tree Creek	*25,000
John Creek	5,000
Little Washougal River	8,000
Wyoming:	
Basin, Paint Rock Creek and branches	20,000
West Tensleep Creek	7,500
Bellefourche, Sand Creek	†10,000
Clearmont, Clear Creek	†5,000
Cody, Anderson Creek	2,500
Gray Bull River	7,500
Murray Creek	7,500
Shoshone Lake	7,500
Shoshone River and branches	17,500
Wood River	5,000
Jacks Creek, Jacks Creek	13,000
Lander, Baldwin Creek	†3,000
Big Wind River	†8,000
Horse Creek	†8,000
Little Popo Agie River	†3,000
Little Warm Spring Creek	†8,000
Popo Agie River and branches	†9,000
Slate Creek	†8,000
Twin Creek	†3,000
Warm Spring Creek	†8,000
Willow Creek	†8,000
Parkman, Gulch Creek	†5,000
Ranchester, Big Goose Creek, East and West Forks	†10,000
Bull Creek	†2,500
Fool Creek	†2,500
Lake Creek	†2,500
Lick Creek	†5,000
Little Goose Creek	†5,000
Tongue River, North Fork	†5,000
Willow Creek	†2,500
Rock Springs, Fremont Lake	15,000
Halfmoon Lake	15,000
Saratoga, Silver Lake	14,000
Sheridan, Jackson Creek	†5,000
State fish commission	*200,000
Sundance, South Miller Creek	†10,000
Yellowstone Park waters	†1,975,000
Total[a]	*1,090,000 †3,821,000 1,878,500

[a] Exclusive of 18,000 fry and 7,000 fingerlings lost in transit.

Distribution of fish and eggs, fiscal year 1918—Continued.

LOCH LEVEN TROUT.

Disposition.	Number.	Disposition.	Number.
Colorado:			
Norrie, Chapman Lake	30,000		
Thomasville, Charles Lake	26,000		
Total	56,000		

LAKE TROUT.

Colorado:		Minnesota—Continued.	
Ivanhoe, Ivanhoe Lake	10,000	Susie Island, Lake Superior	†400,000
Leadville, Twin Lakes	40,000	Two Harbors, Lake Superior	†750,000
Illinois: Spring Grove, State fish commission	*100,000	New Hampshire:	
Iowa: Lansing, State fish commission	*50,000	Bristol, Newfound Lake	†3,000
Maine:		Enfield, Mascoma Lake	†2,000
Big Lake, Big Lake	†10,000	Laconia, State fish commission	*100,000
Dedham, Manns Brook	38,000	Lebanon, Crystal Lake	†2,000
Phillips Lake	38,000	Pike, Lake Tarleton	1,722
Grand Lake, Grand Lake	†13,570	New York:	
North Belgrade, State fish commission	*100,000	Albany, State fish commission	*11,766,000
Massachusetts:		Au Sable Forks, Crystal Lake	†13,330
Lee, Greenwater Pond	†1,500	Silver Lake	†10,000
Laurel Lake	†1,500	Bear Point, Lake Ontario	†992,250
Shaw Pond	†1,500	Charity Shoals, Lake Ontario	†702,900
Stockbridge Lake	†1,500	Dutch Point, Lake Ontario	†340,000
Michigan:		Fox Island, Lake Ontario	†762,750
Alpena, Lake Huron	†175,000	Gabriels, Clear Pond	†6,000
Big Rock, Lake Michigan	†3,325,560	Galloo Island, Lake Ontario	†427,950
Cathead Reef, Lake Michigan	†301,200	Gloversville, Lake Pleasant	†15,000
Charlevoix Reef, Lake Michigan	†5,962,120	Sacandaga Lake	†15,000
Cheboygan, Lake Huron	†200,000	Grenadier Island, Lake Ontario	†2,254,400
Mackinaw Straits	†150,000	Hardscrabble, Lake Ontario	†330,750
Covington, Warm Lake	†8,000	Hayes Point, Lake Ontario	†344,250
Escanaba, Lake Michigan	†300,000	Hopewell Junction, Sylvan Lake	†20,000
Fishermens Island, Lake Michigan	†3,325,560	Lake Placid, Lake Placid	†15,000
Fish Island, Lake Superior	†600,000	Long Lake West, Loon Pond	*50,000
Frankford, Lake Michigan	†300,000	Pigeon Island, Lake Ontario	†283,500
Harbor Beach, Lake Huron	†100,000	Port Henry, Clear Pond	†30,000
Houghton, Lake Superior	†625,000	Port Jervis, Bauer Lake	†10,000
Irishmans Grounds, Lake Michigan	†1,108,520	Stony Point, Lake Ontario	†1,181,250
Iron River, Iron Lake	†10,000	Tibbetts Point, Lake Ontario	†40,800
Pickerel Lake	†8,000	Trumansburg, Cayuga Lake	†37,500
Long Point, Lake Superior	†800,000	Westport, Ledge Lake	†12,000
Manistique, Lake Michigan	†200,000	Wawonaisa Lake	†12,000
Mission Point, Grand Traverse Bay	†1,108,520	Willsboro, Warm Pond	†20,000
Munising, Lake Superior	†625,000	Ohio:	
Nine Mile Point, Lake Michigan	†1,108,520	Kellys Island, Lake Erie	†593,000
Northville, State fish commission	*2,550,000	Put in Bay, State fish commission	*700,000
Presque Isle, Lake Superior	†625,000	South Dakota: Fruitdale, Orman Reservoir	4,275
Rock Harbor, Lake Superior	†800,000	Vermont:	
St. Ignace, Mackinaw Straits	†175,000	Cambridge, State fish commission	*300,000
Tioga Siding, Big King Lake	†8,000	Middlebury, Lake Dunmore	†3,000
Little King Lake	†6,000	Washington: Chewelah, State fish commission	*300,000
Tobins Harbor, Lake Superior	†585,000	Wisconsin:	
Vanderbilt, Pickerel Lake	†10,000	Brule River, Lake Superior	†240,000
Washington Harbor, Lake Superior	†700,000	Lake Millicent, Crystal Lake	10,500
Wrights Island, Lake Superior	†800,000	Pembine, Lindquist Lake	8,000
Minnesota:		Smith Lake	6,000
Beaver Bay, Lake Superior	†300,000	Port Wing, Lake Superior	†1,000,000
Chicago Bay, Lake Superior	†450,000	Sheboygan, State fish commission	*5,402,000
Clearbrook, Peterson Lake	10,000	Three Lakes, Mary Lake	8,000
Steenerson Lake	6,000	Wyoming:	
Duluth, Lake Superior	1,500	Lander, Little Popo Agie River	28,800
Ely, Eve Lake	10,000	McCarthy Lake	2,000
Fishermens Home, Lake Superior	†800,000	Moccasin Lake	2,000
French River, Lake Superior	†750,000	Shoshoni, Bar Gee Lake	2,000
Grand Marais, Lake Superior	†450,000		
Grand Portage, Lake Superior	†400,000	Total[a]	*21,718,000 †39,599,200 226,797
Knife River, Lake Superior	†750,000		
St. Paul, State fish commission	*300,000		
Sucker River, Lake Superior	†750,000		

[a] Exclusive of 50,000 fry lost in transit.

Distribution of fish and eggs, fiscal year 1918—Continued.

BROOK TROUT.

Disposition.	Number.
Alaska: Juneau, applicant	*100,000
Arizona:	
Flagstaff, Oak Creek	16,000
Globe, Ash Creek	8,000
Tucson, Sabino Creek	22,000
California: Point Reyes, Lime Gulch Creek	*25,000
Colorado:	
Alamosa, Rio Grande	35,000
Aspen, Fall Creek	3,000
New York Lake	5,000
North American Lake	5,000
Austin, Currant Creek	10,000
Surface Creek, Middle Fork	8,000
Tongue Creek	16,000
Bailey, Platte River and tributaries	75,000
Prossers Lake	4,000
Bear Creek, Bear Creek	12,000
Biglow, Frying Pan River, North Fork	25,000
Morman Creek	10,000
Savage Lake	18,000
Bilk Siding, Bilk Creek	10,000
Black Hawk, Dory Lake	14,000
Boulder, Four Mile Creek	23,000
Jim Creek	23,000
Left Hand Creek	23,000
Middle Boulder Creek	10,000
Middle St. Vrain River	15,000
Bowie, Hubbard Creek	8,000
Terror Creek	10,000
Buena Vista, Cottonwood Creek	36,000
Canon City, Beaver Creek	10,000
West Beaver Creek	20,000
Carbondale, Snowmass Creek	6,000
Cascade, Cascade Creek	10,000
Cathers Springs, Fountain Creek	4,000
Cimarron, Big Cimarron River	26,000
Lake Number One	6,000
Lake Number Two	10,000
Little Cimarron River, East Prong	10,000
Clyde, Middle Beaver Creek	8,000
Colorado Springs, Bentall's pond	2,000
Doners Pond	6,000
Glen Eyrie Lakes	210,000
Nursery Pond	75,000
Cotopaxi, Lake Creek Lake	8,000
Crossons, South Platte River	40,000
Durango, Florida River	18,000
Edwards, East Lake	18,000
Eldora, Lake Eldora	8,000
Eldora Lake, Middle Boulder Creek	15,000
Fort Collins, Cache La Poudre River	30,000
Cache La Poudre River, North Fork	26,000
Fort Garland, Ute Creek	20,000
Fraser, Elk Creek	14,000
Ranch Creek	12,000
Granby, Stillwater Creek	13,000
Grousemont, Platte River and tributaries	75,000
Gypsum, Gypsum Creek	16,000
Hartsel, Antero Lake	100,000
Hotchkiss, Crystal Creek	12,000
Ivanhoe, Ivanhoe Creek	10,000
Ivanhoe Lake	15,000
Morman Lake	10,000
Lake George, Turkey Creek	12,000
Laramie, McIntyre Creek	10,000
McIntyre Lake	15,000
Leadville, Busk Creek	15,000
Empire Creek	1,000
Musgrove Lakes	380,000
Turquoise Lake	260,000
Loveland, Big Thompson River	55,000
Malta, Crystal Lake	13,000
Lake Creek	15,000
Mancos, East Mancos Creek	10,000
Meredith, Jakeman Creek	15,000
Midland, Loshbaugh Lakes	2,000
Mineral Hot Springs, Wild Cherry Creek Lake	6,000
Colorado—Continued.	
Minturn, Two Elk Creek	8,000
Nast, Frying Pan Lake	6,000
Frying Pan River, South Fork	60,000
Ivanhoe Creek	10,000
Newcomb, Boulder Creek, South Fork	18,000
Norrie, Deeds Creek	10,000
Frying Pan River	25,000
Savage Lake	6,000
Oak Creek, Silver Creek	12,000
Ophir, Deep Creek	8,000
Wilson Creek	6,000
Palmer Lake, Butler Pond	6,000
Pitkin, Quartz Creek	4,000
Placerville, Beaver Creek	12,000
Naturita Creek	12,000
Saltado Creek	8,000
Placita, Lily Lake	20,000
Mountain View Lake	10,000
Wood Creek	6,000
Radium, Gutzbis Lake	8,000
Red Cliff, Fall Creek	8,000
Notch Mountain Creek	6,000
Turkey Creek	10,000
Rosemont, Engelbrecht Lakes	6,000
Ruedi, Ruedi Creek	20,000
Saderland, Gould Creek	8,000
Salida, Cochetopa Creek	15,000
South Arkansas River, North Fork	15,000
Sellar, Cunningham Creek	12,000
Shawnee, Platte River and tributaries	105,000
Silver Plume, Clear Creek, Middle Fork	18,000
Singleton, Singleton Lake	4,000
South Fork, Rio Grande, South Fork	19,000
Steamboat Springs, Summit Lake	39,000
Stoner Creek, Stoner Creek	10,000
West Dolores River	12,000
Texas Creek, Spruce Creek Lake	17,000
Thomasville, Engelbrecht Lakes	440,000
Fairview Lake	6,000
Lime Creek	48,000
Timber Spur, East Dolores River	18,000
West Dolores River	18,000
Vanadium, Big Bear Creek	10,000
Victor, Bison Lake	20,000
East Eight Mile Lake	4,000
Hughlitt's pond	2,000
Skaguay Lake	6,000
Ward, Duck Lake	8,000
Goose Lake	60,000
James Creek	8,000
Silver Lake	60,000
Yuki Lake	8,000
Weller, Platte River	25,000
Westcliffe, Venable Lake	8,000
Whitewater, West Creek	12,000
Woodland Park, Seven Springs Pond	4,000
Trout Creek	10,000
West Creek	20,000
Woodland Park Lakes	44,000
Yampa, Fish Lake	9,000
Connecticut:	
Haddam, Mill Creek	600
Hartford, Broad Brook	2,000
Copper Mine Brook	5,000
Hubbard Brook	6,000
Salmon Brook	4,000
Trout Brook, branch of	5,000
Jewett City, Broad Brook	400
Madison, Neck River	600
New London, Great Brook	1,200
New Milford, Kent Hollow Brook	600
West Aspatuck River	2,000
Norwich, Broad Brook	2,400
Choat Brook	1,900
Kimball Brook	1,500
Simsbury, Salmon, Bissel brooks	2,000
Unionville, Mill Brook	2,000

Distribution of fish and eggs, fiscal year 1918—Continued.

BROOK TROUT—Continued.

Disposition.	Number.
Connecticut—Continued.	
Vernon, Box Brook	500
Wauregan, Blackwell Brook	1,000
Georgia:	
Lakemont, Big Cove Creek	1,000
Nacoochee, Crumley Creek	2,000
Idaho:	
Drummond, Condah Creek	1,500
Harvard, Palouse River, North Fork	1,500
Hayden Lake, Hayden Lake	3,000
Humphrey, Beaver Creek	1,250
Idaho Falls, Teton River	3,750
Kooskia, Ingraham's pond	900
Naples, Falf Creek	1,350
Preston, Bear Creek	5,000
Salmon, Twin Lakes	3,000
Wallace, Coeur d'Alene River, North Fork	1,500
Weiser, Mann Creek	2,000
Monroe Creek	2,000
Rock Creek	2,000
Scott Creek	2,000
Illinois:	
Anna, Hudgens Creek	400
Moosehead, Mill Creek	800
Indiana:	
Michigan City, Palmer Creek	3,000
Spring Brook	4,000
Valparaiso, Willow Creek	†10,000
Iowa:	
Calmar, Protivin Creek	1,200
Trout Creek	800
Pansing, State fish commission	*50,000
Spring Creek	300
Kentucky:	
Harlan, Cumberland River, Martin Fork	600
Maine:	
Attean, Attean Lake	†7,500
Bog Pond	†2,500
Clearwater Pond	†5,000
Hatchery Brook	†2,500
Moose Pond	†2,500
Slackers Pond	†2,500
Thompson Brook	†2,500
Williams Brook	†2,500
Augusta, Lake Cobbosseecontee	†24,000
Bar Mills, Silver Brook	500
Belgrade, Great Lake	†18,000
Long Lake	†18,000
Bigelow, Big Island Pond	†6,000
Ell Pond	†4,800
Jim Pond	†4,800
Little Tee Pond	†2,400
Mount Bigelow Pond	†2,400
Rock Pond	†2,400
Shallow Pond	†2,400
Spring Lake	†2,400
West Carry Pond	†2,400
Bingham, Pleasant Pond	†8,000
Bluehill, Mill Brook	†9,000
Bridgton, Keyes Pond	†4,000
Brownfield, Little Saco River	†3,600
Shapards River	†3,600
Bryants Pond, Lake Christopher	3,000
Camden, State fish commission	*100,000
Corinna, Alder Brook	†5,000
Craig Brook, Partridge Pond	†10,000
Dedham, Branch Pond	†50,000
Phillips Lake	†60,000
Dexter, Goulds Pond	†5,000
Howard Brook	†5,000
Jimmie Brook	†5,000
Lake Wassookeag	†7,500
Puffers Pond	†5,000
Eagle Lake, Eagle Lake	†12,000
Square Lake	†12,000
Maine—Continued.	
East Orland, Craig Pond	†50,000
	400
Gully Brook	400
Hearts Pond	500
Patten Brook	†4,000
Patten Pond	†10,000
Rocky Pond	600
Wardswell Brook	200
Ellsworth, Branch Pond	†50,000
Pattens Pond	†93,000
Farmington, North Pond	†7,200
Wilson Lake	†5,400
Fryeburg, Clays Pond	†3,600
Elkins Brook	†3,600
Little Saco River	†3,600
Wards Pond	†3,600
Greenville Junction, Arnold Pond	†12,000
Crosby Pond	†12,000
Echo Pond	†18,000
Hathorn Bog Pond	†12,000
Horseshoe Pond	†12,000
Mass Bog Pond	†12,000
Rum Pond	†18,000
Squaw Pond	†24,000
West Cove Brook	†24,000
Harrison, Crystal Lake	†5,000
Long Lake	†5,000
Holeb, Barrett Pond	†2,500
Big Fish Pond	†5,000
Bog Brook	†5,000
Cedar Pond	†2,500
Fish Pond	†5,000
Gulf Brook	†2,500
Holen Lake	†5,000
Indian Pond	†5,000
Long Pond	†5,000
Lowell Pond	†5,000
Moose River	†10,000
Round Pond	†2,500
Sherman Pond	†5,000
Turner Pond	†10,000
Twin Island Pond	†2,500
Island Falls, Mattawamkeag Lake	†10,000
Jackman, Alder Brook Pond	†7,500
Benjamin Pond	†2,500
Fish Pond	†7,500
Gilbert Brook	†5,000
Heald Pond	†7,500
Horseshoe Pond	†2,500
Luther Pond	†7,500
Mud Pond	†2,500
Sandy Brook	†7,500
Kineo Station, Carry Brook	†8,000
Scotean Brook	†4,000
Tomhegan Brook	†6,000
Lincoln Mills, Alder Brook	†5,000
McGeorges, Cathance Lake	†2,500
Monmouth, Cochnewagan Lake	†7,200
Purgatory Pond	500
Sand Pond	300
Norcross, Henderson Pond	†7,500
North Anson, Embden Pond	†6,000
North Belgrade, Messalonskee Lake	†10,800
North Sedgewick, Friend Brook	†5,000
Oquossoc, Rangeley Chain of Lakes	4,000
Otis, Great Brook	†267,200
Portage, Portage Lake	†8,000
Presque Isle, Arnold Brook	†7,500
Presque Isle River	†17,500
Rangeley, Gull Pond	†4,500
Orbeton Brook	†4,500
Saddleback Lake	†9,000
Trout Pond	†3,000
Saco, Boothby Brook	200
Burham Brook	200
Buzzell Brook	200

Distribution of fish and eggs, fiscal year 1918—Continued.

BROOK TROUT—Continued.

Disposition.	Number.
Maine—Continued.	
Saco, Cold Spring Brook	100
Davis Brook	200
Diamond Spring Brook	200
Foss Brook	100
Hill Brook	200
Redwater Brook	200
Ricker Brook	100
Runnells Brook	300
Smith Brook	300
South Windham, Black Brook	†3,600
Doles Brook	†3,600
Steep Falls, Horn Pond	†4,000
Waterville, Patties Pond	†8,000
West Sebago, Hancock Lake	†4,000
Winthrop, Lake Maranocook	†7,200
Maryland:	
Arlington, Butler Branch	1,000
Baltimore, Baisman Run	2,000
Bee Tree Run	2,000
Dippingpond Run	2,000
Severn Run	2,500
Boring, Hollingsworth Run	5,000
McGills Run	9,000
Ellicott City, Oakland Branch	1,000
Frederick, Braddock Creek	2,000
Fishing Creek	8,000
Glencoe, Stony Run	4,000
Harman, Clarks Brook	750
Highfield, Cascade Creek	500
Relay, Bull Branch	1,000
Riderwood, Unknown Branch	1,500
Overshot Branch	1,500
Roland Branch	2,500
Rocks, Hollow Rock Creek	1,000
Lagrange Creek	1,000
Rock Vale Creek	1,500
Ruxton, Poe's pond	1,000
Turnpike, Green Branch	4,000
Massachusetts:	
Athol, Carter Brook	200
Fever Brook	500
Moccasin Brook	400
Rand Brook	300
Swift River, East Branch	300
Cushman, Long Plain Brook	400
Gardner, Popple Camp Brook	8,000
Sanders Pond	5,000
Greenfield, Mountain Pond	200
Stone Creek	1,600
Hartsville, Konkapot Creek	1,000
Swann Brook	300
Holyoke, Bachelder Brook	1,600
Crosby Brook	400
Spruce Corner Brook	400
Stony Brook	1,600
Kingston, Soule Pond	200
Lee, Beartown Mountain Brook	†4,000
East Lee Brook	†4,000
Hop Brook	†4,000
Peggy Brook	†4,000
Tyringham Brook	†5,000
Washington Mountain Brook	†4,000
New Bedford, Doggett Brook	4,000
Parker Brook	4,000
Wood Brook	3,500
Northampton, Shaw Brook, Westfield Branch	1,600
Walker Pond	1,000
North Dana, Silver Brook	5,000
Pittsfield, Clark Brook	†1,000
Shaker Brook	†2,000
Tyngsboro, Butterfield Pond	1,000
Michigan:	
Baldwin, Baldwin Creek	†16,000
Bessemer, Myers Creek	†1,000
Beulah, Platte River	†17,500
Black River, Black River	†25,000
Boon, Wharler Creek	†7,000
Brand, Weldon Creek	†32,000

Disposition.	Number.
Michigan—Continued.	
Bruce Crossing, Johnson Creek	†2,000
Cement City, Wheaton Pond	†1,000
Clare, Tobacco River	†7,500
Copemish, Little Bear Creek	†10,500
Covington, Case Creek	†1,000
Dreher Creek	†1,000
Kelsey Creek	†1,000
Rock River	†1,000
Watson Creek	†1,000
East Tawas, Cold Creek	†50,000
Silver Creek	†20,000
Elmwood, Thirty Three Creek	†1,000
Emery Junction, Au Gres River, East Branch	†25,000
Farwell, Chippewa River	†16,000
Gaylord, Au Sable River and tributaries	†100,000 2,500
Pigeon River	5,000
Hale, Hale Creek	†6,000
Smith Creek	†8,000
Vaughn Creek	†6,000
Hartford, Hart Creek, East and West Branches	3,000
Hillman, Bullock Creek	5,000
Pike Creek	5,000
Smith Creek	5,000
Indian River, Spring Brook River	†10,000
Iron River, Cook Run	†2,000
Iron River, Branch of	†1,000
Paint River	†7,000
Ironwood, Black River	†1,000
Montreal River	†1,000
Jackson, Crouches Brook	†5,000
Kenton, Maggie Walton Lake	†3,000
Little Manistee, Little Manistee River	†20,000
Marenisco, Alder Creek	†2,000
Barrs Brook	†1,000
Bradys Brook	†1,000
Brush Creek	†1,000
Clover Creek	†2,000
Fisher Creek	†2,000
Fox Creek	†1,000
Honey Creek	†1,000
Jimmie Thomas Brook	†2,000
Jones Brook	†1,000
Kimble Creek	†1,000
Lemon Creek	†2,000
McDonald Creek	†2,000
McKinney Creek	†2,000
Pigeon Creek	†2,000
Rileys Brook	†2,000
Ryans Brook	†2,000
Willow Creek	†2,000
Marion, Ghost Creek	†17,500
Norvana, Sanburn River	†16,000
Paynesville, Ontonagon River, Middle Fork	†4,000
Perch Siding, Perch Creek	†1,000
Reed City, Johnson Hewett Brooks	†6,000
Roscommon, Au Sable River, South Branch	†20,000
Stager, Stager Creek	†2,000
Stager Junction, Naults Creek	†2,000
Thomaston, Spring Creek	†3,000
Thompsonville, Betsey River	†10,000
Tioga Siding, Hickey Creek	†1,000
Tioga Creek	†1,000
Wingleton, Kinney Creek	5,000
Pere Marquette River	5,250
Yuma, Slagle Creek	†20,000
Minnesota:	
Clearbrook, Clearbrook Creek	†4,000
Falk Lake	†3,000
Ruffy Brook	†3,000
Cold Spring, Cold Spring Creek	3,000
Dakota, Dakota Creek	3,000
Richmond Creek	3,000
Dover, Bateman Creek	1,000

Distribution of fish and eggs, fiscal year 1918—Continued.

BROOK TROUT—Continued.

Disposition.	Number.
Minnesota—Continued.	
Dover, Drake Creek	3,000
Holdridge Creek	1,000
Kammer Creek	1,000
Landon Creek	1,000
Duluth, Woodland Creek	†4,000
Woodland Creek, West Branch	†2,000
Ely, Burntside River	†4,000
Lonstrof Creek, East and West Branches	†5,000
Highland, Little Gooseberry River	†4,000
Knife River, Nepissiquit Lake	†3,000
Lewiston, Enterprise Creek	1,500
Ferguson Creek	1,500
Hemingway Creek	1,500
Johns Valley Creek	1,500
Pine Creek	1,500
Rush Creek	500
Whitewater Creek and branches	4,500
Minnesota City, Bear Valley Creek	1,500
Middle Valley Creek	1,500
Rollingstone Creek	1,500
Rupprecht Creek	1,500
Speltz Valley Creek	1,500
Straight Valley Creek	1,500
Rushford, Axness Creek	1,000
Cooledge Creek	1,000
Crains Creek	2,000
Daley Creek	1,000
Ferguson Creek	1,000
Gaffney Creek	1,000
Hemingway Creek	2,000
Meade Creek	1,000
Onstine Creek	1,000
Opheim Creek	1,000
Overland Creek	1,000
Rupprecht Creek	2,000
Torkelson Creek	1,000
St. Cloud, Mill Creek	4,000
Spring Valley, Cold Spring Creek	1,000
Elva Creek	1,000
Hamilton Creek	1,000
Iredel Creek	2,000
Kingsley Creek	3,000
Mahood Creek	3,000
Root River, North Branch	625
Spring Valley Creek	3,000
Two Harbors, Big Gooseberry River	†3,000
Big Stewart River	†3,000
Crow Creek	†3,000
Encampment Creek	†3,000
Knife River	†3,000
Little Stewart River	†3,000
Silver Creek	†3,000
Split Rock River	†3,000
Stony Creek	†3,000
Whalan, Diamond Creek	3,000
Gribbin Creek	2,000
Winona, Cedar Creek	1,000
East Burns Valley Creek	1,000
Gilmore Valley Creek	1,000
Pleasant Valley Creek	1,000
West Burns Valley Creek	1,000
Wiscoy Creek	1,000
Montana:	
Alder, Ruby Creek	2,500
Armstrong, Spring Creek	750
Avon, Little Blackfoot River	3,000
Baker, Little Beaver Creek	2,250
Belgrade, Benhart Creek	4,500
Bull Run	6,000
Cowan Creek	6,000
Kennedy Creek	7,500
Middle Creek	12,000
Big Timber, Boulder Creek	1,500
Four Mile Spring Pond	6,000
Simmons Creek	8,400
Billings, Danford Run	4,800

Disposition.	Number.
Montana—Continued.	
Bozeman, Baker Creek	3,000
Batin Creek	1,000
Bostwick Creek	3,000
Bridge Creek	3,000
Camp Creek	3,000
Carlin Creek	1,000
Cockrell Creek	1,000
Curtis Creek	1,000
Dry Creek	10,200
Fish Creek	1,000
Heeb Creek	1,000
Jackel Creek	1,000
Lansing Creek	1,000
McDonnell Creek	1,000
Martin Creek	1,000
Miner Creek	6,000
Nixon Creek	3,000
Pasha Creek	1,000
Smith Creek	1,000
Story Creek	3,000
Stuckey Creek	2,000
Thompson Creek	1,000
Tice Creek	1,000
Bruno, Musselshell River	625
Butte, Bison Creek	3,000
Carabella, Green Lake	2,100
Corwin Springs, Cedar Creek	500
Cutler Creek	250
Dell, Sage Creek	1,250
Dillon, French Creek Pond	500
Rattlesnake Lake	1,000
Dixon, Ninepipes Lake	900
Pablo Lake	900
Drummond, Flint River	1,500
Fergus, Brush Creek	1,800
Gardner, Glen Creek	9,000
Park Branch	8,400
Glacier Park, Grinnell Lake	3,000
Josephine Lake	3,000
St. Marys River, North Fork	3,850
St. Marys River, West Fork	4,400
Two Medicine Lake	4,000
Upper Cut Bank Creek	8,000
Hamilton, Spring Creek	200
Harlem, Lodge Pole Creek	2,400
Peoples Creek	2,400
Harlowton, Agnes Creek	6,000
American Fork Creek	1,050
Careless Creek	8,000
Fish Creek	6,000
Hopley Creek and tributaries	11,175
Lebo Creek	1,050
Lebo Lake	900
McVey Creek	4,000
Spring Creek	4,000
Swimming Woman Creek	8,000
Havre, Beaver Creek	2,400
Big Sandy Creek	1,500
Box Elder Creek	2,400
Hedgesville, Swimming Woman Creek	6,000
Hobson, Yogo Creek	6,000
Joliet, Red Lodge Creek	1,250
Joplin, Big Sage Creek	600
Josephine, Sixteen Mile Creek	1,000
Judith Gap, Reservoir Lake	4,000
Lewistown, Beaver Creek	450
Judith River	600
Pike Creek	4,000
Spring Creek, East Fork	6,000
Lima, Little Sheep Creek	400
Livingston, Brisbin Creek	1,650
Fleshman Creek	2,750
Pine Creek	2,750
Spring Creek	3,300
Summerland Creek	1,650
Trail Creek	2,750

Distribution of fish and eggs, fiscal year 1918—Continued.

BROOK TROUT—Continued.

Disposition.	Number.
Montana—Continued.	
Lodge Grass, Lodge Grass Creek	12,000
Malta, Nelson Lake	6,600
Manhattan, Heeb Creek	750
McLellen Creek	1,650
Ridgley Creek	1,650
Martindale, Daisy Creek	1,000
Whitetail Creek	600
Medicine Lake, Brush Lake	1,600
Missoula, Belmont Creek	400
Bitter Root River	8,000
Blackfoot River	600
Browns Lake	800
Clearwater River	600
Cyrs Creek	3,200
Deer Creek	400
Dick Creek	800
Kleinschmidt Lake	800
Lake Inez	800
Lo Lo Creek	1,500
Long Lake	800
Placid Lake	400
Salmon Lake (A)	400
Salmon Lake (B)	800
Seeley Lake	400
Three Mile Creek	9,600
Norris, Meadow Creek	51,750
Noxon, Bull River	750
Park City, Yellowstone River	6,000
Plains, Dog Lake	1,500
Pony, Watt Lake	2,200
Red Lodge, Red Lodge Creek	1,125
Ringling, Battle Creek	4,800
Beaver Creek	5,000
Big Birch Creek	5,000
Big Spring Creek	2,400
Cammas Creek	4,000
Lake Creek	1,600
Newlan Creek	6,000
Smith River, North Fork	5,000
Whitetail Creek	4,000
Roberts, Red Lodge Creek	625
Sappington, Jefferson Creek	450
Shawmut, Tony Creek	8,000
Sixteen, Indian Creek	300
Straw, Russell Creek	200
Three Forks, Jefferson River, Lower Fork	6,000
Toston, Crow Creek	30,000
Muddy Creek	12,000
Swamp Creek	10,000
Townsend, Deep Creek	400
Duck Creek	24,000
Missouri River	400
Trout Creek, Trout Creek	1,200
Twin Bridges, Wisconsin Lake	500
Twodot, Big Elk Creek	900
Mexican John Creek	6,400
Whitefish, Beaver Lake	900
Swift Creek	4,500
Whitefish Lake	1,500
White Sulphur Spring, Sheep Creek	750
Smith River, North Fork	750
Yellowstone, Cougar Creek	2,337
Duck Creek	2,337
Tepee Creek	2,338
Trapper Creek	2,200
Watkins Creek	4,538
Nebraska:	
Andrews, White Clay Creek	5,250
Angora, Indian Creek	1,200
Chadron, Chadron Creek	2,500
Deadlouse Creek	2,500
Little Bordeaux Creek	2,500
Gordon, Antelope Creek	10,000
Larabie Creek	6,000
Snake Creek	10,000
White Clay Creek	10,000
Lewellen, Otter Creek	1,200

Disposition.	Number.
New Hampshire:	
Bennington, Lake George	10,000
Moose Brook	2,000
Rearing Pond	2,000
Russell Brook	3,000
Salmon Brook	3,000
Bristol, Coalarch Brook	2,000
Cockermouth River	3,000
Danforth Brook	1,000
Dick Brown Brook	1,000
Fowler River	3,000
Horicon Brook	1,500
Newfound Lake	3,000
Patten Brook	2,000
Pemigewassett River	8,000
Smith River	5,000
Taylor Brook	2,000
Ten Mile Brook	1,000
Welton Falls Brook	3,000
Canaan, Allendale Pond	500
Blodgett Pond	4,800
Bog Brook	800
Bryant Pond	1,500
Chase Brook	800
Chellis Brook	800
Clark Pond	4,800
Conrow Brook	800
Cumming Pond	6,400
Currier Brook	800
Davis Brook	800
Decelle Pond	1,000
Fairweather Brook	2,800
Ford Brook	800
French Brook	800
Gulf Brook	800
Hames Brook	800
Hart Pond	2,300
Indian River	3,200
Kennedy Pond	1,000
Kilton Brook	800
Kimball Hill Brook	1,600
Kimball Hill Pond	1,000
Lowell Pond	750
Mascoma River	3,200
Mill Brook	800
Morse Brook	800
Mudget Brook	750
Murch Brook	800
Orange Brook	1,600
Orange Pond	6,400
Powers Pond	2,000
Range Brook	800
Rocky Branch	800
Rogers Brook	500
Sargent Brook	800
Spectacle Pond	2,000
Spring Brook	800
Summit Brook	800
Thompson Brook	1,600
Charlestown, Benware Brook	2,000
Great Brook	5,000
Reservoir Brook	3,000
Cherry Mountain, Appleby Brook	†4,500
Cherry Mountain Brook	†4,500
Mill Brook	†6,000
Fabyans, Abenaki Brook	†4,000
Ammojoosuc River	†4,000
Black Brook	†4,000
Clay Brook	†4,000
Clinton Brook	†4,000
Crawford Brook	†4,000
Deception Brook	†4,000
Jefferson Brook	†4,000
Lake Anderson	†4,000
Lake Carolyn	†3,000
Mountain Echo Brook	†4,000
Sebossis Brook	†4,000
Twin Rivers	†3,000
Franklin, Call Brook	5,000

Distribution of fish and eggs, fiscal year 1918—Continued.

BROOK TROUT—Continued.

Disposition.	Number.
New Hampshire—Continued.	
Franklin, Hill Brook	3,000
Mountain Brook	5,000
Putney Brook	4,000
Gorham, Blue Brook	†3,000
Cedar Brook	†6,000
Chickwolnepy Brook	500
Wild River	†6,000
Grafton, Hoyt Brook	2,000
South Grafton Brook	4,000
Stockwell Brook	4,000
Tuttle Brook	2,000
Hancock, Half Moon Pond	2,000
Hillsboro, Village Brook	3,000
Keene, Boyce Brook	2,500
Fall Brook	1,500
Great Brook	5,000
Holbrook Brook	1,000
Miry Brook	1,500
Perry Brook	1,000
Lebanon, Blood Brook	3,000
Great Brook	1,500
Hibbard Brook	3,000
Mink Brook	8,000
Manchester, Bog Brook	2,000
Bowman Brook	2,000
Brickyard Brook	2,000
Cold Stream Brook	2,000
Dan Little Brook	2,000
Darrah Brook	1,000
Harry Brook	2,000
Leach Brook	2,000
Little Cohas Brook	2,000
Long Meadow Brook	2,000
McNeil Brook	1,000
McQuade Brook	2,000
Manter Brook	2,000
Merrill Brook	2,000
Patten Brook	7,000
Peters Brook	2,000
Pierce Brook	2,000
Pulpit Brook	2,000
Ray Brook	5,000
Riddle Brook	2,000
Whittle Brook	2,000
Nashau, Bartemus Brook	2,000
Beaver Brook	3,000
Budro Brook	2,000
Doctor Hill Brook	2,000
Duval Brook	1,000
Flint Brook	2,000
Ford Brook	1,000
Glover Brook	1,000
Greenleaf Brook	2,000
Hardy Brook	2,000
Little Nesenkeag Brook	3,000
Lyd Reed Brook	2,000
Muddy Brook	2,000
Naticook Brook	2,000
Nesenkeag Brook	4,000
Norman Howe Brook	2,000
Old Maids Brook	1,000
Peacock Brook	2,000
Pegleg Brook	1,000
Second Brook	3,000
Silver Spring Brook	2,000
Smalls Brook	2,000
Third Brook	1,000
Willow Bridge Brook	2,000
Witch Brook	3,000
Newport, Cutts Brook	5,000
Long Pond Brook	4,000
Sawyer Brook	4,000
Shedd Brook	4,000
Sugar River, North Branch	7,000
Pike, Oliverian River	2,000
Potter Place, Cold Pond	8,000
Powwow River, Evans Brook	6,000
Humes Brook	6,000
New Hampshire—Continued.	
Suncook, Goss Brook	2,500
Pease Brook	3,500
Woodsville, Ammonoosuc River	2,400
New Jersey:	
Burlington, Assiscunk Creek	10,000
Englewood, Cemetery Brook	4,000
Closter Brook	4,000
Cresskill Brook	4,000
Denarest Brook	4,000
Metzler Brook	4,000
Northvale Brook	4,000
Oak Ridge, Stony Brook Lake	6,000
New Mexico:	
Chama, Brazos River, South Fork	14,000
Canjilon Creek	12,000
Cannones River	10,000
Gavilon Creek	18,000
Cimarron, Ponil River	20,000
Embudo, Angostura Creek	7,500
La Junta Creek	7,500
Folsom, Dry Cimarron River	20,000
Glorietta, Pecos River	30,000
Lamy, Santa Fe River	10,000
Las Vegas, Gallinas River	22,000
Mora River	10,000
Trout Springs Brook	6,000
Tularosa, Tularosa River	4,000
New York:	
Albany, Cox's pond	3,000
Beacon, Trout Brook	2,400
Benson Mines, Little River	†20,000
Cambridge, Camden Brook	4,000
Coulter Brook	3,000
Duel Hollow Brook	3,000
Loweries Brook	3,000
Mannard Brook	2,000
Muncy Hollow Brook	2,000
Terry Brook	5,000
Catskill, Cauterskill Creek	†6,000
Divasskill Creek	†3,500
	500
Kirkstown Creek	†5,000
Saxes Brook	†2,000
Shinglekill Creek	†4,000
Whippoorwill Brook	†2,000
Cobleskill, Bark River	4,000
Beddy Brook	3,000
Cole Hollow Brook	2,000
Dibble Hollow Brook	2,000
Heddon Creek	2,000
Karker Brook	1,000
Lime Kiln Brook	2,000
Vintonton Brook	2,000
West Middleburgh Brook	3,000
West Richmondville Brook	3,000
Deposit, Oquaga Creek	†20,000
Elmira, Baldwin Creek	†4,000
Banfield Creek	†2,000
Beaver Brook	†2,000
Catherine Creek	†8,000
Cornish Creek	†4,000
Cranberry Creek	†3,000
Goldsmith Creek	†4,000
Jackson Creek	†3,000
Miller Brook	†1,000
Newtown Creek	†8,000
Seeley Creek	†7,000
Smith Creek	†1,000
South Creek	†6,000
Texas Creek	†1,000
Wynkoop Creek	†8,000
Gabriels, Lake Meacham	†10,000
Genoa, Fred Green Creek	†1,000
Gamel Creek	†5,000
Pine Hollow Creek	†6,000
Greene, Geneganstlet Brook	†10,000
Wheeler Brook	†5,000
Hamburg, Gates's pond	†8,000

Distribution of fish and eggs, fiscal year 1918—Continued.

BROOK TROUT—Continued.

Disposition.	Number.
New York—Continued.	
Harrisville, Big Hill Pond	†8,000
Hinckley, West Canada Creek, East Branch	†14,000
Hopewell Junction, Nortlekill Creek	5,000
Hornell, Seeley Creek	3,000
Hunter, Bataviakill Creek	10,000
Ithica, applicant	*3,175
Kings, Cole Brook	2,000
Lake Placid, Chub River	†10,000
Liberty, Robertson Brook	†5,000
Long Lake West, Bear Pond	†5,000
Charley Pond	†5,000
Loon Pond	†5,000
Lower Bettner Pond	†5,000
Otter Pond	†5,000
Upper Bettner Pond	†5,000
Malone Junction, Duane Creek	†10,000
Trout River	†10,000
Millbrook, Beverly Creek	800
Canoe Creek	6,000
Montour Falls, Havan Glen Creek	†3,000
Spring Brook	†2,000
Texas Hollow Brook	†5,000
Newark, Trout Run	†8,000
Van Valkenburg Brook	†2,000
New Lebanon, Reynolds Brook	3,000
Schell Brook	1,000
Shaker Brook	2,000
Newton Falls, Grasse River	†15,000
North Creek, Chatiemac Lake	2,000
Clear Pond	†8,000
North Ilion, Steeles Creek	†16,000
North Lansing, Teeter Creek	†5,000
Oneonta, Ouleout Creek	†24,000
Oswego, Black Creek	†8,000
Pawling, Swamp River	6,000
Port Henry, Wolf Pond	†3,000
Port Jervis, Bushkill Creek	5,000
Mongaup River	8,000
Shinglekill Brook	4,000
Steinykill Creek	3,000
Vandemark Brook	4,000
Rome, Fish Creek	4,000
Roscoe, Beaverkill River	†20,000
Horse Brook	†2,000
St. Regis Falls, Guide Board Brook	600
St. Regis River and branches	†10,000
Stanley Brook	2,200
Stony Brook	800
Santa Clara, Deep Pond	3,600
Deer Pond	†4,000
Dimmerick Brook	†4,000
Dimmock Brook	†5,000
Guide Board Brook	†2,000
Spring Pond	†4,000
Schenectady, Alyslaus Creek	†2,000
Hungerkill Creek	3,000
Sherburne, Cole Brook	3,000
Four Corners Brook	†2,000
North Norwich Brook	†2,000
Sherburne Lake	†3,000
Swamp Brook	†8,000
South Lansing, Ernst Teeter Creek	†2,000
Steinberg Creek	†4,000
Syracuse, Bear Trap Brook	†6,000
Bishop Brook	2,000
Carpenter Brook	2,000
Dunlap Brook	†8,000
Evansward Trout Pond	1,000
Geddes Brook	500
Hitchcock Brook	†8,000
Klein Brook	300
LaFayette Creek	1,000
Mont Freda Brook	1,000
Peck Brook	6,000
Pools Brook	300
	†8,000
	1,000
	2,500

Disposition.	Number.
New York—Continued.	
Syracuse, Redhead Brook	1,000
South Hollow Brook	3,000
Stony Brook	300
Stone Quarry Falls Brook	300
Swamp Brook	2,500
Troop "D" Farm Brook	†3,000
Van Bergen Brook	300
Unadilla, Bennet Creek	1,000
Westport, Birch Pond	1,000
Finch Pond	†10,000
Lake Nokomis	†4,000
Ledge Brook	†4,000
Lower Moss Pond	†3,000
Schroon River	†3,000
Secret Pond	†4,000
Underwood Brook	†4,000
Upper Moss Pond	†3,000
Wawonaissa Brook	†3,000
Whitehall, Cold Brook	†3,000
Pike Brook	†3,000
Willsboro, Little Sky Pond	†3,000
North Carolina:	1,000
Asheville, Bent Creek	5,000
Cane Creek, Rocky Fork	1,000
Brevard, Grassy Creek	3,000
Canton, Crawford Creek	3,000
Daniels Creek	2,000
Lenoir Creek	2,000
Cherryfield, Cherryfield Creek	1,000
Edgemont, Sassafras Creek	3,000
Etowah, Big Willow Creek	5,000
Highland, Cullasaja River	2,000
Horseshoe, Mills River	10,000
Hot Springs, Lance Creek	1,000
Lake Toxaway, Chattooga River	6,000
Fowler Creek	1,000
Jeams Creek	2,000
Pine Creek	1,000
Linville, Big Grassy Creek	3,000
Grandmother Creek	4,000
Kawana Lake	5,000
Linville River	4,000
Linville River, West Fork	3,000
Little Grassy Creek	3,000
Micaville, South Toe River	5,000
North Wilkesboro, Boone Highway Lake	3,000
Mulberry Creek, Branch of	4,000
Saw Mill Creek	3,000
Old Fort, Curtis Creek	13,500
Laurel Jog Creek	4,500
Pisgah Forest, Davidson River	15,000
Laurel Fork Creek	2,000
Little River	6,000
Mills River, South Fork	10,000
Poplar, Pigeon Fork Creek	4,000
Rosman, French Broad River, Middle Fork	4,000
Laurel Creek	2,000
Little Creek	1,000
Old Toxaway Creek	3,000
Rock Creek	2,000
Toxaway Creek	500
Selica, Mason Creek	1,000
Patterson Creek	1,000
Shulls Mills, Cane Creek, Laurel Fork	3,000
Cane Creek, North Fork	3,000
Laurel Creek	5,000
New River, Doe Fork	3,000
Shups Creek	3,000
Valle Creek	2,000
Thurmond, Headies Creek	500
Waynesville, Arrington Creek	2,000
Ohio:	
Bellefontaine, Spring Branch	†5,000
Canton, Nimishillen Creek, West Branch	†10,000

Distribution of fish and eggs, fiscal year 1918—Continued.

BROOK TROUT—Continued.

Disposition.	Number.
Ohio—Continued.	
Chagrin Falls, Bliss Creek	†4,000
	3,000
Hudson, Sullivan Creek	†3,000
Sugar Grove, Bowers Run	†8,000
Clear Creek	†20,000
Urbana, Cedar Creek	†6,000
Oregon:	
Clackamas, Clackamas River	570
Parrot Creek	10,000
State fish commission	36,000
Grants Pass, Moorland Pond	500
Lindsey, Lindsey Creek	8,000
Viento Creek	10,000
Warren Creek	6,000
Pennsylvania:	
Altoona, Canoe Creek	6,000
Piney Creek	6,000
Sinking Run	6,000
Ashland, Blases Run	1,800
Buck Horn Run	1,200
Kulps Run	1,200
Roaring Creek	2,400
Bedford, Breast Work Run	2,000
Fyan Run	2,000
Laurel Run	2,000
Benton, Fishing Creek	2,400
Berwick, Briar Creek	3,000
Birdell, Two Log Run	1,500
Cammal, Browns Run	†3,000
Mill Run	†2,000
Miller Run	†3,000
Trout Run	†4,000
Truman Run	†2,000
Cherry Run, Penns Creek	5,000
Christiana, Smyrna Run	1,000
Coatesville, Broad Run	5,000
Pequea Creek	2,000
Columbia, Jones Creek	3,000
Cresco, Bushkill Creek	4,200
Downington, Beaver Run	4,000
Broad Run	900
Easton, Bushkill Creek	5,000
Martins Creek	5,000
Ebensburg, Chest Creek	1,000
Conemaugh Creek	2,000
Gallaher Run	1,000
Howells Creek	1,000
Jacks Run	1,000
James Creek	1,000
James Run	1,000
Jonathan Creek	1,000
Kemler Run	1,000
Laurel Lick Run	1,000
Moore Run	1,000
Noel Run	1,000
Roaring Run	1,000
Robbs Run	1,000
Skelleys Run	1,000
Smiths Run	1,000
Tin Mill Run	1,000
Tudor Run	1,000
Watters Run	1,000
Ephrata, Rudys Run	1,500
Sahlox Creek	1,500
Shimps Run	1,000
Trout Creek	3,000
Fairview, Tent Woods Brook	†2,000
Forks, Fishing Creek	†2,400
Gaines Junction, Big Spring Creek	†2,000
Bloody Run	†2,000
Chaffee Run	†2,000
Cowbarn Branch	†3,000
Deer Lick Run	†2,000
Dewey Hollow Run	†2,000
Elk Run	†2,000
Elk Run, West Branch	†3,000
Knowlton Run	†2,000
Maynard Branch	†2,000
Phoenix Run	†2,000

Disposition.	Number.
Pennsylvania—Continued.	
Gaines Junction, Remington Brook	†2,000
Shin Hollow Run	†2,000
Water Trough Hollow Run	†2,000
Wetmore Run	†2,000
Gap, Birch Run	1,500
Livingston Run	3,000
Slaymakertown Run	1,500
Hale Eddy, Shad Pound Brook, Thomas Branch	†6,000
Hatboro, Pennypack Creek	1,500
Hoadleys, Middle Creek	2,400
Wangum Creek	1,800
Howard, Big Hayes Run	†2,000
Brickly Run	†2,000
Butler Run	†2,000
Counsil Run	†2,000
Fishing Creek	†2,000
Laurel Run	†2,000
Lick Run	†2,000
Little Hayes Run	†2,000
Lucas Run	†2,000
McNanny Run	†2,000
Marsh Creek	†4,000
Marsh Creek, North Branch	†2,000
Singer Creek	†2,000
Hulls, Birch Run	†3,000
Borea Branch	†2,000
Camp Run	†3,000
East Fork Creek	†4,000
Horton Run	†3,000
Jamison Run	†2,000
Prouty Creek	†2,000
Stone Lick Run	†3,000
Wharton Run	†3,000
Wild Bear Run	†3,000
Indiana, Stake Run	2,000
Jersey Shore, Big Run	2,000
Browns Run	2,000
Fishing Creek	3,000
Gamble Run	2,000
Larrys Creek, Left Fork	2,000
Larrys Creek, Right Fork	2,000
McMerns Run	2,000
Miller Run	1,000
Pine Bottom Creek	4,000
Rouch Creek	2,000
Trout Run	2,000
White Deer Creek	2,000
Johnstown, Bens Creek, North Fork	4,000
Dalton Run	4,000
Mill Creek	4,000
Salt Lick Run	100
Kelton, White Clay Creek, West Branch	2,000
Kinzers, Keneagy Run	2,000
Londonland Creek	1,500
Lake Ariel, Five Mile Creek	3,000
Lamar, Bear Run	†2,000
Cherry Run	†2,000
Fishing Creek	†4,000
Huston Gap Run	†2,000
Kettle Creek	†2,000
Little Kettle Creek	†2,000
McCaleb Run	†2,000
Nittany Creek	†4,000
Roaring Run	†6,000
Ruhl Pond	†2,000
Lancaster, Big Springs Run	1,000
Culler Run	2,000
Eckert Run	1,000
Spring Run	2,000
Steinmans Run	2,000
Landisville, Baer Spring Run	1,000
Laporte, Deer Hollow Run	2,000
Dutchman Run	2,000
Elk Run	2,000
Floodwood Run	2,000
Pole Bridge Run	2,000
Shaner Burg Run	2,000

Distribution of fish and eggs, fiscal year 1918—Continued.

BROOK TROUT—Continued.

Disposition.	Number.
Pennsylvania—Continued.	
Lemont, Buffalo Run	†3,000
Cedar Creek	†2,000
Centre Furnace Branch	†2,000
Collier Run	†2,000
Laurel Run	†3,000
Mackey Run	†2,000
Rock Spring Run	†2,000
Shaffer Creek	†3,000
Shingletown Run	†2,000
Sinking Creek	†2,000
Slab Canin Creek	†2,000
Spring Creek	†3,000
Lewisburg, Lick Run	2,000
Weiker Run	3,000
Lewistown Junction, Fishers Meadow Run	600
Honey Creek	900
Treister Valley Creek	1,500
Lititz, Kettle Run	1,000
Popular Run, East Branch	1,000
McElhattan, Chathams Run	4,000
Lick Run	2,000
Little Chathams Run	1,500
McElhattan Run	2,000
Plum Run	3,500
Queens Run	2,000
McKnightstown, Marsh Creek	1,500
Milford, Mandermark Creek	4,000
Mill Hall, Fishing Creek	2,500
Moslem, Moslem Creek	2,000
Narvon, Beartown Run	2,000
Spring Brook	1,000
New Germantown, Fowlers Run	900
Sheaffer Run	900
Oak Hall, Bear Meadow Run	†2,000
Corner Run	†2,000
Galbraith Run	†4,000
Laurel Run	†4,000
McFarlane Run	†2,000
Meyers Run	†2,000
Shingletown Gap Run	†2,000
Spring Creek	†4,000
Spring Gap Run	†2,000
Orviston, Big Run and branches	†10,000
Council Run	†2,000
Eddy Lick Run	†2,000
Hayes Run	†2,000
Marsh Creek	†2,000
Rock Run	†2,000
Two Runs	†2,000
Peach Bottom, Blackburn Spring Run	6,000
Pen Argyl, Altemus Creek	2,000
Bushkill Creek	2,000
Cherry Valley Creek	2,000
Green Valley Creek	2,000
Pleasant Valley Creek	3,000
Renolds Creek	2,000
Ross Common Creek	2,000
Ross Valley Creek	2,000
Spruce Run	2,000
Petersburg, Bells Run	1,000
Garners Run	3,000
Globe Run	3,000
Henry Run	1,000
Laurel Run	1,000
Roaring Run	3,000
Stone Creek	3,000
Phoenixville, Mashalmac Creek	12,000
Picture Rocks, Muncy Creek	4,800
Port Clinton, Ketner Run	3,000
Rattling Run	3,000
Pottsville, Black Creek	7,000
Roberstown, Shenks Run	1,000
Shickshinny, Arnolds Creek	1,800
Huntingdon Creek	2,400
Lick Branch	1,800
Phillips Creek	2,400
Shingle Run	2,400

Disposition.	Number.
Pennsylvania—Continued.	
Sinnemahoning, Cooks Run	†2,000
Slatington, Benningers Creek	3,000
Friedens Creek	1,000
Jorden Creek	1,000
Smiths Gap Creek	6,000
Stillwater, Fishing Creek	3,000
Sunbury, Limestone Run	3,000
Susquehanna, Egypt Creek	†7,000
Hemlock Creek	†7,000
Swarthmore, Little Crim Creek	4,000
Tamaqua, Beaver Creek	3,000
Bushy Run	1,000
Owl Creek	4,000
Rabbit Run	3,000
Still Creek	3,000
Trout Run, Bear Run	1,000
Blacks Creek	1,000
Blackhouse Creek	1,000
Bunnell Run	1,000
English Run	1,000
Flocks Run	1,000
Four Mile Run	1,000
Otter Run	1,000
Pack Horse Creek	1,000
Rock Run	1,000
Smith Run	1,000
Texas Creek	1,000
Trout Run	1,000
Wolf Run	1,000
Troy, Brandy Run	1,000
Bullard Creek	1,000
Cease Run	1,000
Chase Creek	1,000
Covert Creek	1,000
Dobbins Creek	1,000
Dry Run	1,000
Fall Brook Creek	1,000
Fellows Creek	1,000
Holmes Creek	1,000
Hunts Creek	1,000
Kiff Run	1,000
Leona Creek	1,000
Little Falls Creek	1,000
Lyons Run	1,000
Maynard Run	1,000
Morgan Creek	1,000
Morris Run	1,000
Palmer Run	1,000
Porter Creek	1,000
Sam Miller Run	1,000
Smith Run	1,000
Spring Run	1,000
Tioga River	1,000
Waterville, Carson Hollow Run	†3,000
Dam Run	†3,000
English Run	†3,000
School House Run	†3,000
Thompson Hollow Run	†2,000
Weatherly, Deneys Creek	2,000
West Chester, Chester Creek	4,000
Lady Bren Run, tributary of	3,000
Radley Run	4,000
Sharpless Run	5,000
West Grove, Doe Run Creek, Left Branch	1,000
White Clay Creek, branch of	1,500
Westtown, Wain Brook	4,000
Williamsport, Bender Run	2,000
Big Bear Creek	10,800
Big Run	2,000
Days Run	1,000
Johnson Run	1,000
Laurel Run	1,000
Long Run	1,000
Loyalsock Creek	3,000
Pleasant Creek	1,000
Plunkett Creek	2,000
Shingle Run	1,000
Windber, Biscuit Spring Run	1,800

Distribution of fish and eggs, fiscal year 1918—Continued.

BROOK TROUT—Continued.

Disposition.	Number.
Pennsylvania—Continued.	
Windber, Cub Run	1,500
Piney Run	1,500
Rhode Island:	
East Greenwich, Wood River, branch of	8,000
Providence, Aldrich Brook	4,000
Bucks Horn Brook	4,000
Harmony Brook	4,000
Huntinghouse Brook	4,000
Rice City Brook	4,000
State fish commission	*50,000
South Dakota:	
Custer, French Creek	16,000
Elmore, Nursery Pond	2,750
Spearfish Creek	3,000
Englewood, Elk Creek	9,000
Englewood Creek	4,500
Whitewood Creek	2,000
Hill City, Spring Creek	22,000
Hot Springs, Fall River	6,000
Hat Creek	6,300
Hysega, Prairie Creek	6,000
Interior, Bear Creek	14,000
Corn Creek	4,000
Hay Creek	6,000
Pine Creek	8,000
Iron Creek, Beaver Creek	6,000
Kadoka, Pass Creek	12,000
Mystic, Castle Creek	9,000
Johnson Lake	4,000
Nugget Creek	10,000
Rapid Creek	8,000
Slate Creek	3,000
Pactola, Lower Deer Creek	5,000
Spring Creek	6,000
Pine Ridge, Porcupine Creek	10,000
Spring Creek	10,000
Wounded Knee Creek	10,000
Pluma, Bear Butte Creek	1,350
Rapid City, Antler Lake	3,000
Canyon Lake	4,000
Electric Light Pond	6,000
Fair Ground Lake	3,000
Indian School Lake	1,500
Jim Creek	9,000
Lime Creek	7,500
Platt Pond	6,000
Rapid Creek	28,375
Slate Creek	21,000
Spring Creek	22,500
Rochford, Rapid Creek	5,700
Rosebud, Rosebud Creek	14,000
St. Onge, False Bottom Creek	2,400
Savoy, Bear Creek	8,000
Beaver Creek	3,000
Little Spearfish Creek	7,600
Spearfish Creek	33,000
Spearfish, Bill Cook Creek	2,000
Chicken Creek	5,000
City Creek	3,000
Coxes Lake Creek	3,000
Crow Creek	6,300
Driskill Creek	1,000
Ernest Branch	5,000
Hemler Creek	4,000
Hilton Gulch Creek	3,000
Hull Creek	3,000
McGill Creek	1,000
McGregor Creek	8,000
Park Creek	1,000
Pettigrew Creek	5,000
Ranch Creek	1,500
Redwater Creek	13,000
Schmidt Creek	7,500
Sinking Spring Creek	1,500
Spearfish Creek and branches	39,650
Stucco Creek	5,000
Sunderland Creek	1,000

Disposition.	Number.
South Dakota—Continued.	
Spearfish, Toomey Creek	5,000
Willow Creek	2,000
Tilford, Elk Creek	2,000
Tennessee:	
Bristol, Rippling Creek	1,000
Elkmont, Bear Wallow Creek	2,000
Rough Creek	3,000
Erwin, State fish commission	*25,000
Hampton, Spring Lake	1,000
Utah: Richfield, Fish Lake	4,500
Vermont:	
Arlington, Battenkill River	1,500
Butternut Brook	†5,000
Duck Pond Brook	†5,000
Fayville Brook	1,000
Roaring Branch	1,400
Warm Brook	350
Barre, Imerson Brook	†3,000
Labrador Brook	†5,000
Ladds Brook	†5,000
Lords Brook	†4,000
Smith Brook	†5,000
Spicer Brook	†5,000
Barton, May Brook	†3,000
May Pond	†5,000
Bellows Falls, Parmalee Brook	1,600
Wright Brook	†5,000
Bennington, Bickford Hollow Brook	1,000
Dunville Brook	1,000
Furnace Brook	1,000
Roaring Branch	2,000
South Brook	1,500
Walloomsac River	2,000
Woodford City Brook	1,500
Brattleboro, Cold Brook	200
Moss Hollow Brook	1,000
Murder Hollow Brook	1,000
Newton Brook	1,200
Pleasant Valley Brook	1,000
Pond Brook	1,000
Slab Hollow Brook	1,000
Slate Rock Brook	1,000
Stickney Brook	1,000
Town Brook	1,200
Weatherhead Hollow Brook	1,000
Whetstone Brook	1,000
Canaan, Big Averill Lake	500
Forest Lake	300
Little Averill Lake	243
Morrill Brook	100
Norton Brook	500
Second Black Branch	100
Yellow Branch	100
Cuttingsville, Spring Lake	600
Danville, Keeser Pond	500
Mud Pond	500
East Berkshire, Nelson Pond	2,000
East Hardwick, Bell Brook	†2,500
Edgewater, Bill Young Brook	†2,000
Kelley Brook	†2,000
Niggerhead Ledge Brook	†3,000
Niggerhead Pond Brook	†5,000
Greensboro, East Greensboro Brook	†2,500
Groton, Darling Pond	†50,000 40,000
Hardwick, Abutment Brook	†1,500
Bailey Brook	†1,000
Collier Brook	†2,000
Cooper Brook	†4,000
Currier Brook	†1,000
Eaden Brook	†2,000
Hardwick Brook	5,600
High Trestle Brook	†3,000
Lamoille River	†5,000
Laundry Brook	†1,000
Norris Brook	†2,000
Paine Brook	†5,000
Porter Brook	†5,000

Distribution of fish and eggs, fiscal year 1918—Continued.

BROOK TROUT—Continued.

Disposition.	Number.
Vermont—Continued.	
Hardwick, Stannard Brook	†5,000
Holden, Bassett Brook	†3,500
Chittenden Pond	†10,000
Clover Vale Brook	†5,000
Coburn Brook	†5,000
Eddy-Brewer Brooks	1,000
Elliott Brook	†5,000
Furnace Brook and Branches	†45,000
	2,604
Hewitt Brook	†10,000
Lafferts Brook	†10,000
Ore Bed Brook	†5,000
Picnic Brook	†10,0000
Randall Brook	†5,000
Rogers Pond	1,500
Sand Spring Brook	†5,000
	1,100
Valley View Brook	†5,000
Hyde Park, Hyde Pond	†3,000
Mud Pond	500
Johnson, Waterman Branch	500
Manchester, Battenkill River	1,000
Cold Spring Brook	†5,000
Mad Tom Brook	†5,000
Manchester Depot, Battenkill River	1,500
Battenkill River, West Branch	1,000
Bowen Brook	1,000
Bowen Brook, North Branch	400
Lye Brook	425
Middlebury, Poor Farm Brook	†12,000
Ripton River	†8,000
Steam Mill Brook	†8,000
Morrisville, Billings Brook	†7,000
Bugbee Brook	†2,000
Copper Brook	†3,000
Darling Brook	†3,000
Green River Brook	†6,000
Hatch Brook	†2,000
Hazen Brook	†2,000
McNall Brook	†4,000
Potash Brook	†6,000
Ryder Brook	†6,000
Shippy Brook	†2,000
Terrell Brook	†6,000
New Haven Junction, Dike Brook	†8,000
Hubbard Brook	†4,000
Newport, Black River	†6,000
	1,500
Buck Brook (A)	†3,000
Buck Brook (B)	†2,000
Center Brook	†4,000
Day Brook	†2,500
Holland Pond	†3,000
	1,000
Holton Brook	†2,000
Jay Branch	†6,000
Jud Brook	†3,000
Kidder Pond	†5,000
Lang Brook	†5,000
Larabee Brook	†3,000
Orcutt Brook	†2,500
Papenaw Brook	†2,000
Tice Brook	†3,500
Turtle Pond	†5,000
Ware Brook	†3,000
Watson Brook	†2,500
Norton Mills, Averill Brook	700
Black Branch	200
Cole Brook	300
Forest Brook	200
Little Averill Brook	200
Nulhegan River	300
Nulhegan River, East Branch	300
Number Six Brook	300
Roaring Brook	200
Swanson Brook	300
Northfield, Houston Pond	†2,500
Whetstone Brook	†2,500
North Montpelier, applicant	*25,000

Disposition.	Number.
Vermont—Continued.	
Norwich, Lake Mitchell	†50,000
Orleans, Dewey Brook	†2,500
Dunham Brook	†3,000
	400
Dutton Brook	†4,000
	400
Gallup Brook	†7,000
Hannant Brook	†2,500
	400
Higgins Brook	2,500
Hog Trough Brook	†3,000
	500
Long Pond	†5,000
	2,000
Matthews Brook	†1,500
	400
Nigger Pond	5,000
	1,500
Parlin Brook	†3,000
Wiggins Brook	400
Willoughby River	†10,000
	1,500
Wyman Brook	5,000
Plainfield, Fifield Brook	†2,000
Gurnsey Brook	†4,000
Kingsbury Branch	†3,000
Winooski River	†8,000
Proctorville, Williams River	†15,000
Randolph, Adams Brook	†4,500
Annis Brook	†2,500
	120
Bass Brook	†2,000
Bear Hill Brook	†3,000
Blanchard Brook	†2,500
Bowman Brook	†2,500
	120
Chandler Brook	†5,000
Clough Brook	†3,500
Cushman Brook	†2,500
Fisher Brook	†2,000
Guild Brook	†2,500
	120
Gulf Brook	†1,000
Holman Brook	†2,500
Howard Hill Brook	†3,500
Mann Brook	†3,000
Meadow Brook	†4,000
	120
Mud Pond	†5,000
Morse Brook	†1,500
Peth Brook	†4,000
Poverty Lane Brook	†3,500
Riford Brook	†2,500
Roaring Brook	†2,000
Roods Brook	†1,500
Roxbury Brook	†3,500
	120
Soper Brook	†2,000
Upper Ayers Brook	†3,000
Upper Meadow Brook	†4,000
St. Johnsbury, Bacon Brook	†5,000
	326
Bennett Brook	300
Blodgett Brook	300
Carpenter Brook	†2,000
Cold Brook	†3,000
	300
Gage Brook (A)	†8,000
	300
Gage Brook (B)	300
Hastings Brook	†8,000
Hawkins Brook	†10,000
Hemingway Brook	300
Joes Brook and tributaries	†25,000
Lawrence Brook	300
Lyster Brook	300
Meadow Brook	†5,000
Miles Brook	300
Parker Brook	†5,000
	258

Distribution of fish and eggs, fiscal year 1918—Continued.

BROOK TROUT—Continued.

Disposition.	Number.
Vermont—Continued.	
St. Johnsbury, Pierce Brook	†5,000
	300
Roberts Brook	†2,000
	300
Sleepers River	†52,000
Spauldings Brook	†5,000
Sutton Brook	182
Walter Andric Brook	†15,000
West Brook	300
Wright Brook	†3,000
Sharon, Lake Mitchell	†29,000
	102,250
Sheldon Junction, Adams Pond	†3,500
Bakersfield Branch	†7,000
Bogue Brook	†3,500
Cold Hollow Brook	†6,000
Cramton Trout Brook	†1,000
Ladd Trout Brook	†3,500
McAllister Brook	†3,500
Mineral Spring Brook	†3,500
St. Johns Brook	†1,000
Stoneville Brook	†2,500
South Royalton, Alco Pond	†5,000
South Ryegate, Bailey Pond	†3,000
Long Pond	†12,000
Mud Pond	†6,000
Peach Brook	†7,000
Scott Brook	†5,000
Springfield, Aldrich Brook	†5,000
Commissary Brook	†5,000
Garrett Brook	†10,000
Joe Boss Brook	†5,000
Scrabble Brook	†5,000
West Springfield Brook	†5,000
Sunderland, Lathrop Brook	†5,000
Walden, Lyford Pond	750
Waterbury, Alder Brook	†2,000
Alder Meadow Brook	†3,000
Barrett Brook	†2,000
Brown Brook	†2,000
Camels Hump Brook	†3,000
Devine Brook	†3,000
Gillette Brook	†2,000
Hayden Hill Brook	†2,000
Iligh Brook	†3,000
Hill Brook	†3,000
Joe Wheeler Brook	†2,000
Melvin Greene Brook	†2,000
Little River	†2,000
Merriam Brook	†2,000
North Fayston Brook	†2,000
Parry Hill Brook	†2,000
Randall Brook	†2,000
Ricker Mountain Brook	†5,000
Ring Brook	†2,000
Roberts Brook	†3,000
Robinson Brook	†2,000
Rood Brook	†2,000
Scrabble Hill Brook	†3,000
Sevene Brook	†3,000
Shaw Brook	†2,000
Spruce Mountain Brook	†2,000
State Farm Brook	†2,000
Stevens Brook	†2,000
Stony Brook	†2,000
Swasey Brook	†2,000
Thatcher Brook	†5,000
Williams Brook	†2,000
Wood Brook	†2,000
Wells River, Club Ponds	†20,765
Halls Brook, branch of	475
Lang Pond	950
Maple Pond	950
Miller Brock Brook	475
Miller Brock Pond	950
West Burke, Beaver Brook	†1,000
West Hartford, Rockland Brook	†3,000
Woodland Brook	†2,000
Westminster, Pecks Pond	400

Disposition.	Number.
Vermont—Continued.	
Wilmington, Alvord Brook	500
Beaver Brook	1,000
Boyd Brook	1,000
Burr Brook	1,000
Cold Brook	1,500
Corse Brook	500
Graves Brook	1,000
Haystack Brook	1,000
Johnson Brook	500
Meadow Brook	1,500
Pike Brook	1,500
Ware Brook	500
Windsor, Ascutneyville Brook	600
Bailey Brook	200
Blood Brook	800
Felchville Brook	800
Lull Brook	200
Mill Brook	1,200
West Brook	200
Virginia:	
Ashburne, Goose Creek	160
Barbours Creek, Fall Branch	500
Big Island, Hunting Creek	1,000
Goshen, Grattons Run	1,500
Hunters, Little Difficult Run	8,000
Marion, Staley Creek	5,000
Orange, Rose River	500
Saltpetre, Allens Branch	640
Staunton, Ramsey Run	2,100
Straight Creek	500
Stuarts Draft, Dodge's pond	600
Washington:	
Boyds, Sherwood Creek	750
Chewelah, Jump off Joe Lake	5,000
Lind, York Lake	450
Marcus, Deep Creek Lake	750
North Yakima, Ahtanum Creek	5,550
Republic, Copper Lake	450
Deep Lake	600
Long Lake	900
Stevenson, Blue Creek	20,000
Blue Lakes	5,000
Spring Creek	2,000
Tacoma, Golden Lake	5,000
Lake Ethel	5,000
Lake James	5,000
Ranger Creek	3,000
South Mowich River	4,000
Spokwash Creek	3,000
Vancouver, Salmon Creek	30,000
Wall Walla, Spring Branch	2,000
West Virginia:	
Capon Springs, Capon Run	3,000
Cass, Cheat River	1,260
Elkins, Valley River	500
Horton, Gandy Creek	800
Midvale, Tygarts River, Middle Fork	800
Prince, Fat Creek	500
Rainelle, Big Clear Creek	4,000
Little Clear Creek	4,000
Richwood, Cherry River, North Fork	1,500
Sandstone, Lick Creek	800
Sewell, Glade Creek	600
Manns Creek	500
Slab Fork, Slab Fork Creek	1,800
Tunnelton, Lick Run	800
Wisconsin:	
Abbotsford, Big Eau Plaine River	1,200
Parkey Creek	800
Alma, Beef Valley Creek	800
Big Waumandee Creek	800
Johns Valley Creek	800
Little Waumandee Creek	800
Norwegian Valley Creek	800
Trout Valley Creek	800
Argyle, Apple Branch Creek	400
Brenna Creek	800
Bangor, Adams Valley Creek	2,000
Big Creek	1,000

Distribution of fish and eggs, fiscal year 1918—Continued.

BROOK TROUT—Continued.

Disposition.	Number.
Wisconsin—Continued.	
Bangor, Burns Creek	2,000
Dutch Creek	2,000
East Branch	2,000
Fish Creek	2,000
Holberg Creek	1,000
Kalkman Creek	1,000
Robinson Creek	3,000
Sand Creek	2,000
Whites Creek	1,000
Wiles Creek	2,000
Bloomer, Hay Creek	400
McCanns Creek	400
Stevens Creek	400
Upper Duncan Creek	600
Blue Mounds, Camp Creek	200
Dolontry Creek	200
Frames Creek	200
Garfoot Creek	200
Ryans Creek	200
Topper Creek	200
Walnut Hollow Creek	200
Cashton, Aarnes Creek	1,000
Baglien Creek	1,000
Timber Coulie Creek	1,000
Chippewa Falls, Little Dry Wood Creek	600
Paint Creek	1,000
Stilson Creek	600
Cylon, Hutton Creek	4,000
Spring Creek	2,000
Willow, River, South Fork	2,000
Deer Park, Willow River, South Fork	5,000
Dodgeville, Berg Creek	200
Berryman Creek	200
Davis Creek	200
Flint Creek	200
Fox Hollow Creek	200
Harker Creek	200
Lores Creek	200
Mendt Creek	200
Symons Branch	200
Wedlake Creek	200
Yager Creek	200
Eau Claire, Alder Creek	200
Balsam Creek	200
Beaver Creek, North Fork	200
Clear Creek	200
Cress Creek	200
Dean Creek	200
Five Mile Creek	200
Graham Creek	200
Hansen Creek	200
Hay Creek	200
Jackson Creek	200
Little Rock Creek	200
Louis Creek	400
Minnow Creek	200
Nine Mile Creek	400
North Creek	200
Pine Creek	200
Rock Creek	400
Sandy Creek	200
Sherman Creek	400
Spring Creek	200
Stone Creek	200
Thorson Creek	200
Trout Creek	400
Wrights Creek	400
Eleva, Adams Creek	200
Anderson Creek	200
Bennett Valley Creek	400
Big Creek	400
Bollinger Creek	200
Haakens Valley Creek	200
Hoven Creek	200
Lindsey Creek	200
Rosman Creek	200
Scrum Creek	200
Trout Creek	200

Disposition.	Number.
Wisconsin—Continued.	
Elmwood, Cave Creek	800
Mosouri Creek	800
Mosouri Creek, South Fork	400
Plum Creek	1,000
Plum Creek, East Fork	400
Porter Creek	400
Fountain City, Bohris Valley Creek	800
Cooks Valley Creek	800
Eagle Valley Creek	800
Freid Valley Creek	800
Glencoe Valley Creek	800
Mentor Valley Creek	800
Pipers Valley Creek	800
Schaffner Valley Creek	800
Schneider Valley Creek	800
Schultz Valley Creek	800
Galesville, Bear Creek	1,000
Beaver Creek, North Fork	2,000
Beaver Creek, South Fork	2,000
Big Tamarack Creek	2,000
Corrigan Creek	1,000
Fox Cooley Creek	1,000
French Creek	2,000
Grants Creek	1,000
Hardies Creek	1,000
Norway Cooley Creek	1,000
Oakum Cooley Creek	1,000
Silver Creek	1,000
Hayward, Hannill Creek	2,000
Hayward Creek	2,000
Meadow Creek	2,000
Potato Creek	2,000
Hudson, Green Race Creek	1,000
Willow River	4,000
Koshkonong, Spring Creek	400
La Crosse, Chipmunk Cooley Creek	4,000
Coon River, North Branch	4,300
Troutdale Creek	3,000
Mellen, Camp Four Creek	†2,000
Camp Ten Creek	†2,000
Camp Twenty-Three Creek	†2,000
Devils Creek	†3,000
Little Beaver Creek	†2,000
McCartier Creek	†1,000
Montreal Creek	†3,000
Mosquito Creek	†2,000
Skunk Creek	†3,000
Snake Creek	†2,000
Mondovi, Armor Creek	200
Brown Creek	200
Carrol Creek	400
Harvey Creek	200
Dutch Creek	200
Fifteen Creek	200
Ford Creek	400
Merriett Creek	200
Rossman Creek	200
Whelan Creek	400
Muscoda, Bloyer Branch	200
Bohn Branch	200
Coon Branch	200
Elston Trout Pond	400
Hoosier Creek	200
Indian Creek	200
Jones Branch	200
Lempke Branch	200
Ludwig Branch	200
Sand Branch	200
Shemaks Creek	800
Six-Mile Branch	600
Studnickka Branch	200
New Auburn, Beaver Creek	400
Hay Creek	400
Sand Creek	400
Norwalk, Bergman Creek	1,600
Brieské Creek	800
Brunner Creek	800
Cook Creek	2,400
Cramer Creek	800
Drier Creek	800

Distribution of fish and eggs, fiscal year 1918—Continued.

BROOK TROUT—Continued.

Disposition.	Number.
Wisconsin—Continued.	
Norwalk, Hertzberg Creek	1,600
Hulls Valley Creek	800
Mitchell Creek	800
Nolan Creek	800
Seekamp Creek	800
Spring Valley Creek	1,600
Stecker Creek	800
Sullivan Creek	1,600
Summit Creek	800
Walz Creek	800
Owens, Meadow Creek	400
Meeks Creek	400
Mengus Creek	400
Rock Creek	400
Skinner Creek	400
Park Falls, Camp Creek	†2,000
Clear Creek	†2,000
Grinsell Creek	†2,000
Murray Creek	†1,000
Pinkerton Creek	†1,000
Rapid Creek	†2,000
Rice Lake, Cobb Creek	3,000
Long Lake Creek	2,000
Tuscobia Creek	2,000
River Falls, Kinnickinick River	6,000
Salmo, Bark Creek	†2,000
Brickyard Creek	†1,000
Lost Creek	†2,000
Onion Creek	†1,000
Pikes Creek	†1,000
Racket River	†1,000
Ravine Park Creek	†1,000
Sand River	†2,000
Siskiwit Creek	†2,000
Spring Creek	†1,000
Sauk City, Bear Creek	600
Blumes Creek	200
Boyles Creek	200
Denzer Creek	200
Dunlap Creek	200
Honey Creek	1,400
Leland Creek	200
Otter Creek	600
Sparta, Angelo Creek	1,000
Angelo Pond	1,000
Ash Creek	1,000
Bailey Creek	1,000
Beaver Creek	2,000
Benson Creek	1,000
Big Creek	2,000
Big Creek Pond	1,000
Bruder Creek	1,000
Bush Creek	1,000
Farmer Valley Creek	1,000
Farr Creek	1,000
La Crosse Creek	1,000
Little Creek	1,000
Little Bailey Creek	1,000
Little Busby Creek	1,000
Little La Crosse Creek	1,000
Little Range Creek	1,000
Little Silver Creek	1,000
Little Swamp Creek	1,000
Morse Creek	1,000
Pauls Valley Creek	1,000
Sand Creek	1,000
Sias Creek	1,000
Silver Creek	1,000
Smith Creek	1,000
Soper Creek	1,000
South Big Creek	1,000
Sparta Creek	1,000
Swamp Creek	1,000
Tar Creek	4,000
Thorbies Creek	1,000
Welch Creek	1,000
Spring Brook, Godfrey Creek	3,000
Little Creek	2,000

Disposition.	Number.
Wisconsin—Continued.	
Spring Green, Jones Creek	400
Sugar Grove Creek	400
Wilson Creek	800
Stanley, Scovin Creek	600
Trempealeau, Beaver Creek	1,000
Crystal Creek	1,000
Dutch Creek	1,000
Fox Cooley Creek	1,000
French Creek	1,000
Holcomb Cooley Creek	1,000
Little Tamarack Creek	1,000
Norwegian Valley Creek	1,000
Pine Creek	1,000
Tamarack Creek	1,000
Turtle Lake, Beaver Creek	3,000
Hay River	4,000
Lightning Creek	2,000
Silver Creek	1,000
Smith Creek	2,000
Turtle Creek	3,000
Waukesha, Baldwin Creek	200
Bidwell Creek	400
Blackwell Creek	200
Chamberlain Creek	200
Coleton Creek	200
Cramer Creek	200
Eagle Creek	200
Garrett Creek	200
Genesee Creek	200
Holcolm Creek	200
Jones Creek	200
Keppen Creek	200
Loves Creek	200
Minick Creek	200
Price Creek	200
Sailsville Creek	200
Scuppernong Creek	200
Thomas Creek	200
Waterville Creek	200
Wilkinson Creek	200
Williams Creek	200
Wrights Creek	200
Westby, Bad Ax Creek	1,000
Berge Creek	1,000
Carlson Creek	1,000
Clackmaker Creek	1,000
Debing Creek	1,000
Hall Creek	1,000
Hanson Creek	1,000
Holte Creek	1,000
Jenson Creek	1,000
Knapp Creek	1,000
Larson Creek	1,000
Nelson Creek	1,000
Oium Creek	1,000
Oium Spring Creek	1,000
Olsen Creek	1,000
Overhagen Creek	1,000
Pederson Creek	1,000
Peterson Creek	1,000
Seas Creek	1,000
Sherve Creek	1,000
Skaug Creek	1,000
Skorsmoen Creek	1,000
Steenson Creek	1,000
Swenson Creek	1,000
Twin Bluff Creek	1,000
Wilton, Gerkes Creek	1,600
Lenahamis Creek	800
Noths Creek	2,400
Wyoming:	
Basin, Solitude Lake	1,600
Beulah, Sand Creek	9,000
Spring Creek	2,000
Clearmont, Clear Creek, Middle Fork	1,200
Clear Creek, North Fork	1,200
Cody, Aldrich Creek	1,200

Distribution of fish and eggs, fiscal year 1918—Continued.

BROOK TROUT—Continued.

Disposition.	Number.
Wyoming—Continued.	
Cody, Bear Creek	1,200
Bellknap Creek	1,600
Bobcat Creek	1,200
Bowlder Creek	1,600
Bull Creek	1,600
Cabin Creek	1,200
Clear Water Creek	1,200
East Fork Creek	1,600
Gooseberry Creek	1,600
Grinnell Creek	1,200
Hardpan Creek	1,600
Holly Creek	800
Jack Creek	1,600
Jordan Creek	2,000
Little Rocky Creek	1,200
Morrison Fork Creek	1,600
Moss Creek	1,200
Newton Creek	1,200
Post Creek	1,200
Rattlesnake Creek	1,600
Red Creek	1,600
Rock Creek	1,600
Sage Creek	2,800
Trout Creek	1,200
Valley Spring Creek	800
Encampment, Encampment Creek	15,000
Grand Encampment Creek	20,000
Evanston, Snowden's pond	2,900
Fox Park, Pinedale Pond	16,000
Greybull, Shell Creek	2,000
Laner, Baldwin Creek	6,000
Beaver Creek	3,000
Blue Hole Creek	1,400
Buffalo Creek	3,500
Crooks Creek	1,750
Dickinson Creek	3,000
Little Popo Agie River	3,000
Little Popo Agie River, North Fork	3,000
Long Creek	3,500
McKinney Creek	1,500
Pacific Creek	3,500
Popo Agie River	6,000
Popo Agie River, Middle Fork	3,000
Rock Creek	3,000
Squaw Creek	3,000
Laramie, Bear Creek	26,000
Wyoming—Continued.	
Laramie, Rock Creek	34,000
Simpson Creek	15,000
Lusk, Clark-Metzger Lake	1,500
Rawhide Creek	1,500
Meads Siding, Pass Creek	18,000
Newcastle, Bear Creek	3,000
Beaver Creek	10,500
Spring Creek	3,000
Stockade Beaver Creek	31,500
Upper Beaver Creek	4,200
Parkman, Lake Creek	1,800
Lick Creek	1,800
Little Horn River, North Fork	900
Ranchester, Black Canon Creek	5,000
Little Tongue River	12,000
McLaughlin Creek	3,000
Red Canon Creek	2,000
Sucker Creek	5,000
Tongue River, South Fork	1,500
Wolf Creek	38,000
Riverton, Big Wind River	3,000
DuNoir River	3,000
Rock River, Boylan Lake	10,000
Rock Springs, Sweeney Creek	3,000
Saratoga, Araster Lake	20,000
Bow Lake	20,000
Cedar Creek	20,000
Cow Creek	20,000
Dipper Lake	15,000
Jacks Creek	70,000
North Platte River	25,000
Rose Creek	15,000
Section Lake No. 9	10,000
Spring Creek	100,000
Twin Lakes	20,000
Sheridan, Beaverdam Lake	2,400
Little Goose Lake	3,000
Little Rapid Creek	4,800
P. K. Lake	8,000
Rapid Creek	9,600
Soldier Creek	5,700
Soldier Creek Lake	2,400
Spear's pond	1,500
Sundance, Houston Creek	10,000
Total [a]	*378,175 †3,876,265 7,882,668

SUNAPEE TROUT.

Vermont:	
Brattleboro, South Pond	7,372

SMELT.

Maine: Otis, Green Lake	†304,750
New York: Willsboro, Warm Pond	†914,000
Total	†1,218,750

PIKE AND PICKEREL.

Arkansas:	
Black Rock, Black River	b 226
Browns Lake, Black River	b 18
Manson, Black River	b 915
Illinois:	
Apple River, Apple River, North Branch	38
Illinois—Continued.	
Blanding, Mississippi River	b 1,000
Freeport, waters of Illinois	360
Galena Junction, Mississippi River	b 1,700
Hanover, Mississippi River	b 1,046
Lena, Mammosser Lake	20
New Boston, Mississippi River	b 219

[a] Exclusive of 79,200 fry and 62,000 fingerlings lost in transit.
[b] Rescued from overflowed lands and restored to original waters.

Distribution of fish and eggs, fiscal year 1918—Continued.

PIKE AND PICKEREL—Continued.

Disposition.	Number.	Disposition.	Number.
Illinois—Continued.		Minnesota:	
Nora, Apple River, East Branch	18	Homer, Mississippi River	a 46,266
Scales Mound, Mill Creek	20	Lake Pepin, Mississippi River	a 260
Warren, Apple River, East Branch	112	Red Wing, Mississippi River	a 235
Iowa:		Wisconsin:	
Bellevue, Mississippi River	a 7,648	Bagley, Mississippi River	a 75
Clayton, Mississippi River	a 250	Bay City, Mississippi River	a 40
Fairport, Mississippi River	a 301	Genoa, Mississippi River	a 1,100
Green Island, Mississippi River	a 19,560	Glenhaven, Mississippi River	a 100
Guttenburg, Mississippi River	a 50	La Crosse, Mississippi River	a 16,505
Iowa Falls, Iowa River	190	Prairie du Chien, Mississippi River	a 1,200
Manchester, Maquoketa River	90	Woodyard, Mississippi River	a 800
North McGregor, Mississippi River	a 4,195	Wyalusing, Mississippi River	a 750
Pleasant Creek, Mississippi River	a 100		
Quarry, Iowa River	126	Total	106,408
Sny Magill, Mississippi River	a 875		

FRESH-WATER DRUM.

Illinois:		Iowa—Continued.	
Blanding, Mississippi River	a 31	Sny Magill, Mississippi River	a 11,000
Galena Junction, Mississippi River	a 85	Louisiana:	
Hanover, Mississippi River	a 22	Atchafalaya, Mississippi River	a 3,175
Meredosia, Illinois River	a 16,200	Wisconsin:	
New Boston, Mississippi River	a 726	Genoa, Mississippi River	a 100
Iowa:		Glenhaven, Mississippi River	a 30,000
Bellevue, Mississippi River	a 937	La Crosse, Mississippi River	a 1,150
Clayton, Mississippi River	a 5,000		
Fairport, Mississippi River	a 47	Total	83,473
Guttenburg, Mississippi River	a 15,000		

CRAPPIE.

Alabama:		Connecticut:	
Athens, Anderson Creek	90	East Haddam, Joshua Pond	1,500
First Creek	135	Winsted, Laurel Heath Lake	200
Birmingham, Scott Branch Pond	300	Delaware: Delaware City, Scotch Lake	600
Blanche, Yellow Creek	75	Georgia:	
Bristow, Spring Creek	75	Cave Springs, Woodstock Lake	90
Guin, Ford's mill pond	350	Dewyrose, Beaverdam Pond	50
Hartford, Choctawhatchie River	385	Forestville, Elner Lake	180
Hurricane Creek	75	Maysville, Martin's pond	25
Helena, Lake Zuldonia	300	Raymond, Raymond Lake	230
Jemison, Cobb's pond	300	Rome, Hillcrest Lake	360
La Pine, Enzor's pond	50	Illinois:	
Letohatchie, Dickson's pond	125	Apple River, Apple River, North Branch	200
Loop, North Spring Creek	75	Belleville, Fern Glen Lake	750
Luverne, Kendrick & Ruff Pond	50	Glendale Lake	600
Minooka, Watson Creek	300	Brighton, Northern Star	450
Mobile, Junction Pond	105	Freeport, Waters of Illinois	20,350
Newton, Atkinson's pond	90	Galena Junction, Mississippi River	a 4,000
Pleasant Gap, Frog Creek	75	Hanover, Mississippi River	a 14,500
Hurricane Creek	75	Lena, Mammooser Lake	300
Prattville, Cotton Mill Pond	75	Meredosia, Illinois River	a 83,075
Goodson Pond	75	New Boston, Mississippi River	a 61,487
Arkansas:		Panama, Clover Leaf Lake	300
Bellefonte, Crooked Creek	160	Scales Mound, Mill Creek	200
Phifer's pond	70	Warren, Apple River, East Branch	800
Black Rock, Black River	a 2,210	Waterloo, Bollinger's pond	750
Browns Lake, Black River	a 1,245	Indiana:	
Crossett, North Lake	95	Culver, Lake Maxinkuckee	600
Fayetteville, Mirror Lake	105	Edinburg, Sugar Creek	225
Harrison, Crooked Creek	130	Indianapolis, Sugar Creek	600
Hot Springs, Fordyce's pond	120	Lena, Blue Pond	75
Gulpha Pond	120	New Albany, Creeks of Floyd County	700
Little Rock, Spring Lake	200	Perrysville, Volkel's pond	200
Manson, Black River	a 6,730	Richmond, Crescent Lake	600
Monticello, Hillcrest Pond	120	Sellersburg, Belknap Lake	825
Rogers, Meadow Pond	70	Worthington, Eel River	225
St. Joe, Blackberry Pond	70	Iowa:	
Cedar Pond	65	Bellevue, Mississippi River	a 562,125
Colorado:		Cincinnati, Euwer's pond	200
Lamar, Two Buttes Lake	500	Clayton, Mississippi River	a 2,135
Las Animas, Adobe Creek Lake	500	Cresco, Turkey River	50
Wray, Robbs Lake	200		

a Rescued from overflowed lands and restored to original waters.

Distribution of fish and eggs, fiscal year 1918—Continued.

CRAPPIE—Continued.

Disposition.	Number.
Iowa—Continued.	
Earlville, Penn Creek	400
Fairport, Mississippi River	a 82,375
Green Island, Mississippi River	a 17,000
Guttenburg, Mississippi River	a 5,100
Iowa Falls, Iowa River	2,550
McClellan, Glen Pond	150
Manchester, Maquoketa River	3,850
North McGregor, Mississippi River	a 152,550
Perry, Raccoon River	1,200
Quarry, Iowa River	3,000
Sny Magill, Mississippi River	a 25,000
Kansas:	
Edwardsville, Cement Lake	300
Lake of the Forest	400
Mission Creek	200
Fort Scott, Sheeler Lake	400
Kansas City, Forest Lake	300
Topeka, Deer Creek	250
Wakarusa Creek	200
Kentucky:	
Catawba, Berger's pond	100
Chilesburg, Graves's pond	100
Franklin, Douglas Pond	75
Lewis Pond	75
Fredonia, Young's pond	150
Georgetown, Elkhorn River	300
Hall's pond (A)	100
Hall's pond (B)	100
Hawesville, Indian Lake	300
Hopkinsville, Little River	500
Lancaster, Bratton's pond	100
Lawrenceburg, Carroll's pond	200
Giffy's pond	100
J. C. Lake	100
Lake Mary Elizabeth	200
Wash's pond	100
Lexington, Lake View Pond	200
Louisville, Hikes Pond	100
Lake Lansdowne	825
Parkview Lake	200
Mayfield, Grant's pond	75
Paris, Lindsay Pond	200
Big Sandy River, Russell Fork	300
Riceville, Fish Hook Pond	100
Shelby, Big Sandy River	300
Shelbyville, Hoke's pond	100
Vandyke's pond	100
Sherman, Smith's pond	100
Versailles, Fox Spring Lake	200
Newman's pond	100
Waddy, Martin's pond	100
Whitesburg, North Fork Lake	200
Winchester, Carroll's pond	100
Duvall's pond	100
Louisiana:	
Baton Rouge, Amite River	a 500
Mississippi River	a 27,900
University Lake	a 2,200
Church Point, Dangereau's pond	50
Guidry's pond	25
Natchitoches, Cane River Lake	500
Norwood, Pepper Pond	150
Ramsay, Lake Catalpa	50
Rayville, Clear Lake	200
South Mansfield, Sweet Bay Pond	50
Winnfield, Crawford Pond	25
Maryland:	
Baltimore, State ponds	200
Charlotte Hall, Spring Dale Pond	100
Massachusetts:	
Lynn, Lower Pond	400
Montville, Sandisfield Lake	100
Michigan:	
Barron Lake, Barron Lake	200
Crystal Falls, Anderson Lake	150
Fortune Lake	300
Gaylord, Dry Dam Ranch Lakes	200
Michigan—Continued.	
Holton, Acker Lake	200
Hemlock Lake	200
Horseshoe Lake	200
Jackson, Wolf Lake	300
Mandan, Beaver Lake	150
Orion, Lake Orion	500
Twin Lake, North Lake	200
West Lake	200
Minnesota:	
Homer, Mississippi River	a 1,266,845
Mentor, Maple Lake	800
Odessa, Abelone Johnson Lake	400
Red Wing, Mississippi River	a 9,425
Rochester, Mill Pond	630
Virginia, Sand Lake	1,200
Mississippi:	
Amory, Cullens's pond	300
Booneville, Cochran's lake	100
Cedar Bluff, Peden's pond	90
Clinton, Johnston's pond	120
Lake Wilson	200
Corinth, Clear Lake	50
Crystal Springs, Palmer's pond	50
Friar Point, Moon Lake	220
Gulf Port, Lakeview Pond	50
Tuxechena Creek	105
Wolf River	105
Hamburg, Fisher's pond	250
Hazlehurst, Plantation Lake	50
Jackson, Bailey Lake	125
Warner's pond	155
Long Beach, Sunnybrook Pond	50
Louisville, Steves Pond	60
McCool, Stevenson's pond	150
Mantee, Valley Pond	50
Mathiston, Pinnix's pond	50
Meridian, Queen City Club Pond	140
South Lake	70
Waterworks Lake	175
Natchez, Vaughan's pond	250
Pachuta, Morgan Lake	105
Port Gibson, Magnolia Pond	100
Rienzi, Michael Lake	100
Ecooba, Trammell's pond	120
Shuqualak, Rogers Pond	120
Starkville, Bunton's pond	90
Reynolds Lake (A)	60
Reynolds Lake (B)	60
Saunders Pond	90
Steens, Taggart Branch	60
Stratton, Willow Pond	60
Terry, Jones's pond	310
Tillman, Sedgeland Pond	155
Waynesboro, Cochran's pond	250
Wheelers, Bennet's lake	50
Woodville, Roland Pond	125
Missouri:	
Aurora, Flat Creek	500
Blackburn, Logsdon's pond	100
Columbia, Brushwood Lake	300
Diamond, Cedar Lake	300
Gashland, Eaden Lake	100
Horine, Country Club Lake	1,050
Kansas City, Silver Lake	300
Swope Park Lake	100
Liberty, Pryor Lake	400
Neosho, Indian Creek	500
Odessa, Lake Vinita	400
Phillipsburg, Bateman's pond	200
Pleasant Hill, Lake Leonard	600
Quail, Lancaster Lake	300
Rocheport, Chinn Lake	300
St. Louis, Poupennys Pond	1,050
Slater, Ellwood Lake	100
Springfield, Ouichita Lakes	400
Nebraska: Sutton, Pleasant View Pond	30

a Rescued from overflowed lands and restored to original waters.

Distribution of fish and eggs, fiscal year 1918—Continued.

CRAPPIE—Continued.

Disposition.	Number.
New Jersey:	
Burlington, Delaware River	450
Morris Plains, Hospital Ponds	500
Penns Grove, Layton Lake	450
New Mexico: Estancia, Cox's pond	375
New York:	
Altamont, Warner Lake	300
Clayton, St. Lawrence River	100
Greene, Echo Lake	100
Jewettville, Reuther Pond	100
Lockport, Red Creek	200
Mount Marion, Highwood Pond	100
Newburgh, Orange Lake	100
Stittville, Lawton's pond	100
Tivoli, Livingston's pond	100
Troy, Snyder Lake	500
North Dakota:	
Binford, Red Willow Lake	500
Lisbon, Sheyenne River	500
Petrel, Lemmon Lake	500
St. John, Lakes of Rolette County	1,600
Ohio:	
Lake View, Indian Lake	200
Newton Falls, Milton Lake	800
Sayre, San Toy Lake	200
Oklahoma:	
Ada, Bird Mill Creek	150
Country Club Lake	150
Jack Fork Creek	225
Sandy Creek	150
Anadarko, Sunnyside Pond	150
Ardmore, Ardmore Lake	200
Hyden's pond	100
Lone Grove Lake	100
Pennington Creek	100
Rod and Gun Club Lake	300
Simpson Lake	100
Three-mile Creek	100
Whitehurst's pond	100
Byars, Railroad Pond	100
Sunnybrook Pond	100
Crowder, Lake Octapocta	150
Mountain Lake	150
Depew, Bennett Lake	75
Eufaula, Mirror Lake	75
Featherstone, Cunningham's pond	75
Elm Farm Pond	75
Gage, Buzzard Roost Pond	300
Goteba, Hinton's pond	150
Guthrie, Farm Pond (A)	100
Farm Pond (B)	100
Woodland Lake	100
Hickory, Armstrong Lake	150
Big Blue Creek	225
Blue Creek	150
Lake Winona	75
Hugo, Outing Lake	350
Roebuck Lake	300
Upton Lake	275
Kingfisher, Glade End Pond	150
Krebs, Manitou Lake	75
Lookeba, Willow Lake	150
McAlester, Lake Talawanda	300
Mangum, Caldwell's pond	100
Moss Spring Pond	300
Sells's pond	100
Medford, Lew Weld Pond	150
School Land Pond	150
Tennant's pond	300
Moore, Cowan's pond	100
Mooreland, Crystal Lake	200
Willow Springs Lake	100
Mountain View, Big Sandy Creek	150
Foutch's pond	300
Haley's lake	300
Jones Lake	300
Magness Lake	300
Vankirk Lake	300
Washita River	300
Wynn Creek	300
Oklahoma—Continued.	
Oklahoma City, Lake Oliver	100
New Country Club Lake	100
Oak Lake	100
Old Country Club Lake	100
Pauls Valley, Roquemore's pond	100
Pawhuska, Birch Creek	450
Cedar Creek	150
Clear Creek	150
Gray Horse Creek	150
North Bird Creek	225
Rock Creek	150
Sand Creek	450
Perry, Country Club Lake	100
Dixon's pond	100
Dolezal's pond	100
Doyle's pond	75
Enright's pond	100
Hoover's pond	75
Johnson's pond	100
King's pond	75
Lawrence's pond	100
McDaniel's pond	100
Pagel's pond	100
Pennington's pond	75
Robinson's pond	100
Sykora Pond	100
Wollard Lake	100
Young's ponds	100
Pittsburg, Lake Austin	300
Pond Creek, Buffalow's pond	300
La Force's pond	150
McClelland Lake	150
Seifert's pond	300
Purcell, Bandy's ponds	300
Bourquin's pond	100
Crawford's ponds	200
Kirk's pond	100
Rackley's pond	100
Wantland's pond	100
Quinton, Starr Lake	150
Red Rock, Swallow's pond	100
Rosedale, Bryant's pond	100
Miser's pond	100
Sapulpa, Henry's pond	150
King's pond	75
Meyer's pond	150
Sharon, Healey Lake	200
Stillwater, Karentz's pond	150
Kerntke's pond	150
Supply, Irwin's pond	200
Thackerville, Blue Lake	100
Tulsa, Schenfield Ponds	450
Union City, Knapp's pond	150
Vici, South Persimmon Pond	100
Welch, Cow Creek	150
Weleetka, Crystal Lake	150
Woodward, Appleget Lake	100
Beatte Lake	100
Bubb Lake	100
Cline Lake	100
Elm Lake	100
Hopkins Lake	100
Kline Lake	100
Larkin Lake	100
Sand Lake	100
Stiller Lake	100
Swarts Lake	100
Turnbull Lake	100
Wegner Lake	100
Willow Lake	100
Workman Lake	100
Zahman Lake	100
Pennsylvania:	
Altoona, Juniata River	800
Williamsport, Loyalsock Creek	300
Wyalusing, Susquehanna River	1,500
South Dakota:	
Hartford, Wall Lake	400
Huron, Lake Byron	500

Distribution of fish and eggs, fiscal year 1918—Continued.

CRAPPIE—Continued.

Disposition.	Number.
South Dakota—Continued.	
Sioux Falls, Lake Simpson	1,200
Sioux City, Waters of South Dakota	2,200
Volga, Lake Tatonkaha	400
Tennessee:	
Atoka, Glen Spring Lake	175
McRee's pond	75
Templeton's pond	150
Brighton, Sunnyside Lake	100
Franklin, Murphy Fork Creek	150
Gallatin, Hogin's pond	60
Halls, Tucker's pond	50
Henning, Sanford's pond	50
Huntingdon, Dill's pond	50
Kerrville, Miller's pond	50
Manchester, Garrett Mill Pond	375
Murfressboro, Hickory Grove Pond	75
Nashville, Little Harpeth River	240
Springfield, Sycamore Creek	175
Tullahoma, Lake Calanthe	300
Virginia:	
Ashland, Luck's pond	300
Beaver Dam, Beaverdam Lake	600
Burkeville, Mallory Pond	150
Byllesby, Meadow Creek	300
New River	300
Charlottesville, University Pond	150
Church Road, Hobbs Run	150
Clifton Forge, Cow Pasture River	150
Dillwyn, Mary Bell Pond	150
Edinburg, Passage Ceek	150
Shenandoah River, North Fork	150
Stony Creek	150
Emporia, Emporia Pond	300
Meherrin Pond	600
Slagle's pond	300
Esmont, Lake Nydrie	300
Fredericksburg, Dowman's pond	150
Glen Allen, Chickahominy River	300
Lorton, Occoquan Creek	300
Lynchburg, James River	900
Maiden, Hening's pond	600
Manassas, Broad Run	450
Bull Run	300
Kettle Run	300
Mount Jackson, Shenandoah River, North Fork	300
New Market, Shenandoah River, North Fork	150
Olinger, Slemp Pond	150
Purdy, Batte's pond	150
Rectortown, Rawlings's pond	600
Richmond, Bryan Park Pond	600
Club Pond	600
Shields Lake	600
Woodlawn Park Lake	150
Spencer, McBride's pond	150
Stuart, Akers's pond	150
Suffolk, Lake Cahoon	750
West Virginia:	
Berkeley Springs, Johnson's mill pond	300
Charleston, Blue Creek	300
Elk River	600
Williamson, Big Sandy River, Tug Fork	300
Wisconsin:	
Alma, State fish commission	1,200
Amery, Pike Lake	400
Bay City, Mississippi River	a 565
Brokaw, Wisconsin River	500
Centuria, Deer Lake	300
Donaldson, Anderson Lake	50
Big Portage Lake	100
Deer Lake	50
Donahue Lake	50
Goose Lake	50
Wisconsin—Continued.	
Donaldson, Landing Lake	50
Little Bass Lake	50
Little Donohue Lake	50
Pickerel Lake	50
Spring Lake	50
Elkhart Lake, Crystal Lake	200
Genoa, Mississippi River	a 1,205
Glenhaven, Mississippi River	a 300
Gordon, Bass Lake	75
Blue Gill Lake	75
Clear Lake	75
Leader Lake	75
Ox Lake	75
Spider Lake	75
Whitefish Lake	75
Grand Rapids, Wisconsin River	200
Hayward, Lake Willard	250
Heafford Junction, Bass Lake	100
Prairie Lake	100
Rice Lake	100
Hillsboro, Baraboo Pond	700
La Crosse, Mississippi River	a 124,050
Ladysmith, Flambeau Pond	200
Lake Millicent, Bingo Lake	50
Boscoe Bay Lake	50
Bubar Lake	50
Crow Lake	50
Five Island Lake	50
Heart Lake	100
Huber Lake	50
Lake Millicent	50
Lost Lake	50
Pike Lake	50
Twin Lake	50
Lake Nebagamon, Lake Nebagamon	400
Manson, Manson Lake	300
Norrie, Cedar Lake	10
Halfway Lake	10
Kelley Pond	10
Lake Wausau	10
Plowman Lake	10
Smith Lake	10
Stony Lake	10
Nye, Round Lake	400
Prairie du Chien, Mississippi River	a 50
Reedsburg, Mirror Lake	400
Rice Lake, Hemlock Lake	600
Cazenovia Mill Pond	75
Richland Centre, Neptune Mill Pond	75
Postel Lake	75
Rodolph Mill Pond	75
Sextonville Mill Pond	75
Schultz Spur, Lake Ackerman	300
Stone Lake, Snag Lake	100
Superior, Amnicon Lake	300
Tomahawk, Bass Lake	100
Road Lake	100
Round Lake	300
Somo Lake	100
Somo River	100
Spirit Lake	100
Swamp Lake	100
Tomahawk River	100
Wisconsin River	100
Wausau, Brokaw Pond	50
Eau Claire River	50
Gilmore Creek	75
Lake Mayflower	100
Lake Wausau	75
Rib River	50
Silver Creek	50
Wisconsin River	50
Woodyard, Mississippi River	a 14,000
Wyalusing, Mississippi River	a 200
Total b	2,905,812

a Rescued from overflowed lands and restored to original waters.
b Exclusive of 6,250 lost in transit.

Distribution of fish and eggs, fiscal year 1918—Continued.

LARGEMOUTH BLACK BASS.

Disposition.	Number.
Alabama:	
Abbeville, Abbey Creek	1,050
Choctawhatchee River	1,400
Cold Lake	700
Hutto's pond	700
Ada, Bell's pond	1,500
Alexander City, Herzfeld's pond	†1,000
Anniston, Allen Pond	3,000
Francis Mill Pond	4,000
Lloyd's pond	3,000
Bayou La Batre, Little River	2,400
Bear Creek, Liberty Pond	100
Belle Mina, Walton Pond	†2,000
Birmingham, East Giles Pond	70
Ketona Pond	80
Lake Purdy	†5,000
Silver Lake	1,000
Brockton, Sawyer Mill Pond	1,750
Calcis, Kellys Creek	2,500
Capps, Choctawhatchee River	1,050
Pine Log Lake	1,050
Carpenter, Hunnicut Creek	200
Castleberry, Etheridge's pond	†3,000
Centerville, Cahaba River	300
Chickasaw, Chickasaw Creek	1,500
Eight Mile Creek	1,500
Greenwood Bayou	1,500
Shell Bayou	1,500
Clanton, Mims's pond	†2,000
Coleanor, Alligator Creek	55
Little Cahaba River	440
Shoal Creek	90
Six Mile Creek	200
Comer, Conikee Creek	1,500
Courtland, Big Nance Creek	†3,000
Swoope Pond	†2,000
Cuba, Jones Pond	50
Wilson's pond	†2,000
Cullman, Eight Mile Creek	†3,000
Decatur, Dobbin Pond	500
Dunavant, Lake Leora	3,000
Epes, Hawkins Pond	†1,000
Fayette, Lindsey Mill Pond	135
Wallace Mill Pond	180
Florala, Lake Jackson	1,400
Parker Pond	700
Fort Payne, Town Creek	4,000
Fowl River, Fowl River	150
Geneva, Hand's mill pond	1,400
Gurley, Flint River	†3,000
Hackleburg, Tyra's pond	50
Headland, Blue Pond	1,050
Davis Pond	1,050
Helena, Buck Creek	1,800
Huntsville, Broham Lake	200
Flint River	2,000
Ida, Coosa River Lake	20
Kelleyton, Corley's pond	4,000
Socopatoy Creek	3,000
Kushla, Chickasaw Bogue Creek	1,200
Lapine, Russell's pond	600
Letohatchee, Caffey's pond	500
McLean's pond	1,000
Williams Lake	1,500
Lineville, Smith's lake	750
Loxley, Corn Branch	†3,000
Luverne, Kendrick's pond	4,000
Ruff's pond	†2,000
Madison, Bronaugh Pond	†4,000
Mobile, Alligator Creek	2,000
Big Creek	900
Dog River, Eslora Prong	2,000
Dog River, Halls Prong	2,000
Lake Hurleosco	500
Little Deer River	2,000
Rabbit Creek	2,000
Spring Lake	225
Three Mile Creek	225
Monroe, Bohannon Mill Creek	†2,000
Brushy Creek	150

Disposition.	Number.
Alabama—Continued.	
Monroe, Flat Creek	400
Lake Park	1,600
Limestone Creek	300
Little Mill Creek	400
Mineral Branch	400
Randon Creek	150
Slaughter's pond	300
Montgomery, Candler's pond	†2,000
Cobbs Ford Lake	†4,000
Mill Creek	†3,000
Mill Creek Lake	†3,000
Samples Pond	†2,000
Murphys Siding, Johnston's mill pond	1,400
Poor Creek	1,050
Spring Lake	1,050
Oneonta, Little Warrior River	3,000
Paint Rock, Paint Rock River	†4,000
Panola, Lake Holah	†3,000
Pelham, Palmetto Mill Lake	†4,000
Pine Apple, Welch's pond	200
Pine Hill, Baggett's pond	†1,000
Sheffield's pond	†3,000
Piper, Alligator Creek Pond	†4,000
Brown's pond	50
Island Ford Pond	†3,000
McGuire Creek	75
Six Mile Creek	†3,000
Prattville, Cotton Mill Pond	225
Ragland, Trout Creek	600
Ramer, Holmes's pond	1,050
Reform, Gum Pond	†1,000
Speed's pond	1,000
Riderwood, Lake Carezel	†3,000
Russellville, Lake Gayley	†3,000
Sellers, Huffman's pond	300
Selma, Brickyard Pond	†2,000
Burn Brae Pond	†3,000
Hill Lake	†2,000
Hunters Pond	†2,000
Jones Creek	120
Oak Pond	†4,000
Snowdoun, Davis's pond	1,000
Snow Hill, Speir's pond	300
Speigner, Speigner Mill Pond	†5,000
Sprague, Norman's pond	900
Spruce Pine, Smith's lake	200
Sulligent, Priddy's lake	20
Sweetwater, Horse Creek	†6,000
Shell Creek	†3,000
Sweetwater Creek	565
Tanner, Peck's pond	100
Troy, Boatner's pond	700
Boswell's pond	1,050
Henderson's pond	1,400
Tuscumbia, Big Nance Creek	240
Tyson, Streely Place Pond	†3,000
Uniontown, Coffee Creek	130
Vance, Vance Pond	1,500
Village Springs, Massey Lake	1,000
Welch, Chicksanoxsee Pond	1,000
Wetumpka, Weoka Creek	†7,000
Whistler, Chickasabougue Creek	1,500
Winfield, Pearce Mill Pond	900
Wegworth Pond	20
Woodstock, East Giles Lake	2,000
Houston Lake	1,500
Arizona:	
Bowie, Lyday's pond	150
Flagstaff, Mormon Lake	200
Globe, Roosevelt Lake	1,950
Holbrook, Ortega Lake	120
Woodruff Pond	120
Tucson, Amado's pond	150
Vail, La Cienega Ranch Pond	150
Williams, Coleman Lake	280
Arkansas:	
Alma, Big Clear Creek	150
Arkadelphia, Ouaxhita River	210

Distribution of fish and eggs, fiscal year 1918—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Number.
Arkansas—Continued.	
Ashdown, Blue Hole Lake	70
Black Rock, Black River	a 766
Bradford, White Lake	65
Browns Lake, Black River	a 73
Crossett, North Lake	60
Edgemont, Red River, South Fork	271
Gilbert, Bear Creek	270
Buffalo River	270
Tomahawk Creek	271
Greenwood, Vache Grasse Creek	300
Vineyard Creek	250
Gurdon, Willow Dell Lake	65
Hardy, Forty Island Creek	115
South Fork River	115
Spring River	230
Harrison, Crooked Creek	271
Little Buffalo Creek	271
Hope, Wilson's pond	70
Jefferson, Big Pasture Pond	70
Spring Pond	70
Joiner, Shawnee Lake	100
Leslie, Little Red River	271
Long Creek	271
Mill Creek	271
Payton Creek	271
Little Rock, Spring Lake	90
Manson, Black River	a 1,075
Mulberry, Big Mulberry Creek	200
Pine Bluff, Fluker Lake	70
Hurricane Creek	70
McAllister Pond	140
Rumley, Little Red River	271
Shirley, Weaver Creek	271
Stamps, Bodcaw Creek	82
Stamps Lake	70
Texarkana, Club Lake	570
Kniffin's pond	70
Reeves Lake	400
Spring Lake	300
Willow Lake	70
Waldo, Jackson Pond	70
Colorado:	
Boulder, Hygiene Lake	125
Maxwell Lake	125
Ni Wot Lake	125
Younglove Lake	125
Denver, Windermere Lake	125
Eastonville, Ayer's pond	75
Grand Junction, Ternahan Lake	200
Lamar, Two Butte Lake	120
Las Animas, Horse Creek Lake	120
Littleton, Wyldermere Lake	125
Longs Spur, Murray Lake	300
Louviers, Louviers Lake	125
Loveland, Mariana Lake	125
Nutch Lake	125
Miramonte, Carter Lake	100
Pueblo, Teller Lake	85
Connecticut:	
East Haddam, Joshua Pond	515
Meriden, Quannipaug Lake	30
West Pond	30
Still River, Emerald Lake	150
Winsted, Farmington River	30
Laurel Heath Lake	30
Delaware:	
Kirkwood, Lump Pond	10
Lincoln City, Cedar Creek Pond	10
Middletown, Noxontown Pond	10
Wilmington, Folly Woods Pond	8
Florida:	
Cottondale, Cole Pond	200
DeFuniak Springs, Brown Branch Pond	2,100
Highland Pond	1,400
Eustis, Lake Johanna	1,400
Lake Geneva, Geneva Lake	2,800
Lucerne Park, Lake Lucerne	200
Lake Hamilton	400
Florida—Continued.	
Orlando, Lake Ivanhoe	1,750
Paxton, Brown Branch Pond	1,750
Pensacola, Querarity Lake	400
Quincy, Bruce's pond	100
River Junction, Mosquito Creek	2,450
Sebring, Hares Lake	4,000
Springside, Silver Lake	1,750
Sorrento, Lake Rutn	1,225
Sutherland, St. George Lake	2,100
Tyler, Fielding Farm Lake	2,100
Windemere, Lake Butler	400
Winter Haven, Lake Martha	1,400
Lake Silver	1,400
Suring's pond	1,050
Georgia:	
Abbeville, Poor Robin Lake	1,050
Acworth, City Reservoir	12
Adel, Futch Mill Creek	2,100
Andersonville, Aycock's pond	750
Athens, Lakeside Lake	2,000
Lyons Pond	2,000
Waterworks Pond	100
Atlanta, Brookhaven Lake	5,000
Capital City Club Lake	5,000
Howard Mill Pond	3,000
Augusta, Spout Creek Pond	5,000
Bainbridge, Lake Douglas	1,050
Blairsville, Butternut Creek	2,100
Bowman, Beaverdam Creek	3,000
Cairo, Akridge's pond	1,050
Canon, Meadowview Bass Pond	1,000
Chula, Whiddon's pond	1,400
Clermont, Chestatee Lake	8,000
Cordele, Brady's pond	1,500
Cornelia, Nancytown Creek	760
Covena, Phillips's pond	300
Covington, Sprindale Pond	1,250
Cuthbert, Harris Pond	100
Tripps Pond	100
Dexter, Malone's pond	100
Ellijay, Rodgers's pond	500
Fort Valley, Myrtle Pond	1,000
Good Hope, South Lake	100
Greensboro, Beaverdam Pond	100
Hartwell, Big Cedar Creek	5,100
Cleveland's pond	1,000
Savannah River	47,960
Hawkinsville, Fountain's mill pond	300
Heardmont, Savannah River	100
Hogansville, Lazylands Lake	4,000
Lakemont, Lake Rabun	2,500
Lavonia, Roberts's pond	175
Leary, Lake Marcelia	2,750
Lexington, Long Creek	5,750
Lookout Lake, Lookout Lake	500
Lumpkin, Clear Pond	2,250
Geeslin's pond	1,000
Liddy's pond	2,250
Worthington Pond	2,250
McDonough, South River	2,000
Macon, Easterland Lake	850
Nelson Mill Pond	3,000
Riggins Mill Pond	3,000
Madison, Barnett's pond	4,000
Poplar Pond	100
Marietta, Golf Club Lake	100
Mauk, Montgomery's pond	450
Maysville, Holland's pond	1,140
Montezuma, Lewis Mill Pond	100
Travelers Rest Pond	100
Nacoochee, Duke Creek	3,000
Newman, Lazylands Lake	3,000
Nunez, Phillips's pond	200
Piney Prong Pond	300
Ocilla, Brushy Creek Pond	3,000
Omega, Hawkins's pond	3,000
Perry, Lakeside Pond	350
Plains, Kidds Mill Pond	2,250
Quitman, Fernside Lake	1,050

a Rescued from overflowed lands and restored to original waters.

Distribution of fish and eggs, fiscal year 1918—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Number.
Georgia—Continued.	
Quitman, Okopilco Creek	1,050
Spence Lake	1,050
Raymond Lake	5,000
Reidsville, Pounding Mill Lake	1,050
Reynolds, Horse Creek Pond	4,000
Robinson, North River	4,000
Rock Mart, Blue Pond	400
Harris Pond	2,000
Rutledge, Rocky Creek Pond	1,000
Sandersville, Gladdin's pond	4,000
Savannah, Greenwich Lake	1,050
Soperton, Courson's pond	300
Thompson's pond	700
Sparta, Bryan Pond	2,000
Statesboro, Beasly Mill Pond	300
Temple, Little Tallapoosa River	7,000
Tifton, New River Pond	1,050
Trion, Chatooga Pond	3,750
Tusculum, Kamataska Pond	1,400
Valdosta, Long Pond	1,050
Shadow Lake	1,750
Sunshine Lake	1,750
Wisenbaker's pond	1,400
Welch, Brasstown Creek	1,600
Wellston, Sandy Run Pond	4,000
Winchester, Felton Mill Pond	1,100
Woodbury, Powers-Sims Pond	3,000
Wray, Harper's pond	1,000
Illinois:	
Anna, Hess Lake	30
Ashley, St. Francis Lake	45
Belvidere, Coon Creek	225
Kishwaukee River	750
Blanding, Mississippi River	a 3,170
Carbondale, Thompson Lake	75
Carrollton, Minnow Lake	300
Walnut Hall Lake	450
Colona, Hennepin Canal	900
DuQuoin, Lake Rutledge	60
Franklin, Burlington Lake	300
Freeport, Waters of Illinois	825
Galena Junction, Mississippi River	a 8,180
Galesburg, Lake Rice	450
Grays Lake, Druse Lake	525
Hannibal, Sni River	450
Hanover, Mississippi River	a 3,660
Irving, Wilson's pond	200
Joliet, Hickory Creek	300
Kankakee, Kankakee River	600
Laclede, Lloyd's pond	30
Lake Forest, Kelley's pond	300
Lake Villa, Deep Lake	300
Lake Zurich, Lake Zurich	300
Lanark, Carroll Creek	225
Meredosia, Illinois River	a 326
Mooseheart, Moose Lake	950
Moro, Rockbridge Lake	200
Naperville, DuPage River, West Branch	156
North Quarry Pond	78
West Quarry Pond	156
New Boston, Mississippi River	a 26,286
Oakland, Embarrass River	12
Olney, City Lake	75
Peoria, Show Lake	200
Pleasant Hill, Emmert Lake	300
Tow Head Lake	300
Polo, Pine Creek	600
Sesser, Keller Lake	60
Sparta, Country Club Lake	75
Springfield, Reiger's pond	200
Thornton, Thornton Lake	170
Tonti, Cottonwood Lake	45
Davidson's pond	15
Waltonville, C. B. & Q. Pond	60
Wilmington, Kankakee River	600
Indiana:	
Angola, Crooked Lake	180
Fox Lake	180
Indiana—Continued.	
Beeson Station, Beeson Pond	160
Bicknell, Phillippe's pond	140
Bluffton, Wabash River	265
Borden, Blue River, Mutton Fork	300
Brazil, Sewer Pipe Pond	70
Cedar Lake, Cedar Lake	160
Columbus, Flat Rock River	500
Danville, Big Raccoon Creek	225
Edinburg, Sugar Creek	210
Fairland, Sugar Creek	210
Greenfield, Brandywine Creek	120
Huntingburg, Waterworks Lake	500
Indianapolis, White River	160
Jeffersonville, Eagle Lake	500
Kewanna, Collins's pond	60
Lake Maxinkuckee	240
Leesburg, Tippecanoe Lake	72
Liberty, Whitewater River, East Fork	40
Manilla, Little Blue River	210
Michigan City, Clear Lake	180
Fish Lake	180
Saguney Lake	180
Tee Lake	180
Vails Mill Pond	180
Mill Creek, Fish Lake	240
New Albany, creeks of Floyd County	650
Orleans, Hudleson's pond	100
Pierceton, Barber Lake	80
Webster Lake	120
Ramsey, Crystal Pond	100
Rome City, Lower Lake	180
Sylvan Lake	300
Saratoga, Shaw Lake	8
Sellersburg, Belknap Lake	1,000
Shelbyville, Flat Rock River	210
Star City, Tippecanoe River	120
Sullivan, Union Pond	210
Summitville, McLain's pond	75
Roseboom's pond	75
Valparaiso, Wahob Lake	180
Veedersburg, Coal Creek	225
Nelson's pond	150
Vincennes, Wabash Lake	210
Wilder, Kankakee River	120
Williamsburg, Greensfork Creek	225
Worthington, Eel River	400
White River	400
Iowa:	
Anamosa, Wapsipinicon River	100
Bellevue, Mississippi River	a 50,870
Blanchard, Crystal Lake	100
Burlington, West Burlington Pond	240
Clear Lake, Clear Lake	800
Cresco, Iowa River	3,600
Turkey River	3,600
Decorah, Upper Iowa River	300
Dewitt, Spring Brook Lake	160
Emmetsburg, Medium Lake	500
Exira, Nishnabotna River	400
Fairport, Mississippi River	a 12,097
Garden City, Muscatine Creek	120
Vails Creek	120
Greene, Shell Rock River	200
Green Island, Mississippi River	a 350
Guttenburg, Mississippi River	a 500
Hazleton, Otter Creek	80
Humeston, Waterworks Pond	120
Iowa Falls, Iowa River	660
Lenox, Lenox Lake	300
Manchester, Maquoketa River	540
Mason City, Clear Lake	500
Lime Creek	500
Ottumwa, Lake Loch Burn	240
Perry, Raccoon River	12,000
Pleasant Creek, Mississippi River	a 100
Quarry, Iowa River	240
Sny Magill, Mississippi River	a 350
Udell, Jones's pond	60
Walford, Knapp Pond	80

a Rescued from overflowed lands and restored to original waters.

Distribution of fish and eggs, fiscal year 1918—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Number.
Kansas:	
Ellis, Saline River	300
Fort Scott, Sheeler Lake	300
Jetmore, Pawnee River	195
Olathe, Country Club Lake	500
Topeka, Lynn Creek	200
Mission Creek	200
Wakarusa Creek	230
Kentucky:	
Banklick, Summit Lake	65
Bowling Green, Briggs's pond	70
Chelf's pond	70
Garvin's pond	70
Goodrum's pond	70
Harris's pond	70
Hendrick's pond (A)	70
Hendrick's pond (B)	70
Jenkin's pond	70
Kister's pond	70
Logan's pond	70
Mitchell's pond	70
Cadiz, Little River	600
Covington, Elmhurst Lake	65
Danville, Stout's pond	195
Elkhorn City, Big Sandy River, Russell Fork	195
Erlanger, Culbertson's pond	65
Fords Branch, Big Sandy River	130
Franklin, Dixon's pond	70
Drakes Creek	70
Drakes Creek, Middle Fork	210
Edwards Pond	70
Finns Pond	70
Gaines Pond	70
Hobdy Pond	70
Merriman Pond	70
Red River	70
Fredonia, Bailey's pond	100
Barn Field Pond	100
Butler's pond	100
Clift's pond	100
Factory Lot Pond	100
Neel Pond	200
Oliver's pond	100
Satterfield's pond	200
Wilson Pond	100
Georgetown, Elkhorn Creek	65
Hall's pond (A)	65
Hall's pond (B)	65
Hall's pond (C)	65
Glasgow, Skeegs Pond	210
Greenup, Little Sandy River	130
Tygart River	195
Hopkinsville, Glass's pond	400
Lake Tandy	600
Little River	1,000
Wallace Pond	400
Lancaster, Bratton's pond	130
Lawrenceburg, Dowling Lake	65
John Lake	65
Lake Cartinhour	65
Lake Mary Elizabeth	130
Leather's pond	65
Lebanon, Bottoms Pond	65
Buckhorn Creek	130
Clear Creek	130
Indian Creek	130
Johnes Fork Creek	130
Medlock Creek	130
North Fork Creek	130
Pittman Creek	195
Pottinger Creek	130
Rolling Fork Creek	195
Salt River, Beech Fork	195
South Fork Creek	130
Waterworks Lake	65
Lexington, Waterworks Lake	195
Louisville, Bernheim's pond	500
Nicholasville, Clifton Pond	65
Hooverhurst Pond	65
Kentucky—Continued.	
Paducah, Wallace Park Lake	200
Pewee Valley, Blue Lake	65
Pikeville, Big Sandy River	65
Big Sandy River, Levisa Fork	195
Johns Creek	195
Rowlett, Green River	280
Samuels, Sherman's pond	130
Shelbyville, Lake of the Maples	65
Ravenwood Pond	130
South Park, South Park Lake	1,000
Springfield, Forest Hill Lake	65
Stanton, Hall's pond	65
Stephensburg, Dutsche's pond	100
The Forks, Big Sandy River, Russell Fork	195
Louisiana:	
Abita Springs, Morgan's pond	300
Baton Rouge, Amite River	a75
Mississippi River	a6,525
University Lake	a550
Bayou Sara, Hereford Lake	1,000
Bernice, Johnson's pond	40
Cade, Boudreaux's pond	250
Pharr's pond	130
Church Point, Latiolois's pond	40
Clinton, Clear Creek	2,500
Leesville, L'Anacoco Bayou	250
Natchitoches, Cane River Lake	260
New Orleans, City Park Lake	†5,000
Opelousas, Caldwell's pond	80
Orange, Conway's Bayou	250
Rayville, Clear Lake	50
Stonewall, Moseley's pond	25
Winnfield, Lake Joyce	180
Zona, Sanford's pond	†2,000
Maine: Poland, Lake Tripp	30
Maryland:	
Baltimore, Deep Creek	210
Charlotte Hall, Lillie Pond	140
Cowenton, Fox Brook	80
Cumberland, Evits Creek	105
Fifteen Mile Creek	150
Potomac River	455
Potomac River, North Branch	105
Town Creek	300
Wills Creek	105
Easton, Peach Blossom Creek	20
Eccleston, Cave Pond	70
Elkton, Back Creek Mill Pond	80
Ellicott City, Dorsey Run	40
Little Patuxent River	120
Ellwood, Beulah Pond	6
Frederick, Monocacy River	360
Gaithersburg, Irvington Lake	70
Geices, Youghiogheny River	150
Hagerstown, Antietam Creek	160
Conococheague Creek	160
Hughesville, Burch Pond	140
Owings Mills, Red Run	120
Passadena Station, Woole's pond	140
Port Deposit, Herring Run, tributaries of	625
Preston, Beulah Mill Pond	6
Fowler Creek Pond	6
Linchester Mill Pond	6
Williston Mill Pond	6
Seneca, Potomac River	a50
Snow Hill, Nassawango Creek	20
Union Bridge, Pipe Creek	120
Woodbine, Oakdale Pond	40
Massachusetts:	
Falmouth, Maier Pond	60
Marblehead, Oliver's pond	30
State Line, Sandisfield Lake	90
Michigan:	
Alpena, Long Lake	500
Ann Harbor, Three Sisters Lake, Middle	300
Caspian, Chicagoan Lake	200

a Rescued from overflowed lands and restored to original waters.

Distribution of fish and eggs, fiscal year 1918—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Number.
Michigan—Continued.	
Crystal Falls, Dawson Lake	175
Fortune Lake	400
Glidden Lake	150
Hager Lake	75
Heart Lake	150
Mud Lake	75
Delaware, Bete Gris Bayou	200
Gratiot Lake	200
Lac La Belle	200
Lake Upson	75
Iron River, Indian Lake	75
Lake Fifteen	75
Ishpeming, Birch Hill Lake	75
Jackson, Browns Lake	120
Grass Lake	180
Portage Lake	120
Wolf Lake	180
Keweenaw Bay, Mud Lake	80
Lake Ann, Lake Ann	400
Lake Roland, Lake Roland	100
McCollum, McCollum Lake	300
Mandan, Breakfast Lake	75
Copper Creek	75
Deer Lake	75
Lake Addie	225
Thayer Lake	75
Marquette, Marguanee Lake	150
Pelissier Lake	75
St. Johns Lake	75
Metropolitan, Six-Mile Lake	150
Michigamme, Gibson Lake	75
Petticoat Lake	75
Negaunee, Horseshoe Lake	120
Park Siding, Silver Lake	205
Pentoga, Chicagoan Lake	120
Indian Lake	160
Sagola, Mitchell Lake	150
Stager, Big Tobin Lake	75
Round Lake	75
Stager Lake	150
Walled Lake, Walled Lake	360
Watersmeet, Lake Marian	75
Witch Lake, Twin Lakes	75
Minnesota:	
Big Lake, Secret Lake	150
Fairmont, Amber Lake	350
Bud Lake	350
George Lake	350
Hall Lake	350
Sisseton Lake	350
Grand Meadow, Pine Lawn Lake	400
Hackensack, Little Whitefish Lake	600
Homer, Mississippi River	a6,247
Kimball, Arrowood Lake	400
La Crosse, Mississippi River	610
Lindstrom, Chisago Lakes	500
Litchfield, Minnebelle Lake	400
Minneapolis, Bush Lake	500
Preston, Root River	525
Root River, North Branch	350
Root River, South Branch	350
Sherburn, Fox Lake	350
Sleepy Eye, Big Cottonwood River	500
Tamarack, Turtle Lake	500
Mississippi:	
Amory, Hatley Pond	100
Artesia, Grassmire Pond	†2,000
Bay Springs, Brown's pond	80
Bryant, Stokes's pond	1,000
Calyx, Daniel's pond	†2,000
Green Lake	†2,000
Hyde Pond	†1,000
Woodlawn Lake	†2,000
Canton, Alligator Lake	300
Big Lake	1,500
Blackston's pond	1,500
Blue Lake	300
Garbarino Lake	200
McDowell Pocket Lake	200

Disposition.	Number.
Mississippi—Continued.	
Canton, Ray's pond	500
Trolio's pond (A)	200
Trolio's pond (B)	300
Vics Pond	1,000
Waverly Lake	300
Will Smith Lake	400
Wood Lake	500
Centerville, Ford's pond	202
Clarksdale, Moon Lake	2,110
Clinton, Phillips's pond	50
Columbus, Clear Pond	2,000
Hatchett's pond	2,000
Lily Lake	2,500
Wades Lake	2,000
Corinth, Crescent Lake	1,500
Nichols Lake	†5,000
Courtland, Lake Charles	500
Durant, Dodd's pond	600
Ethel, Belk's pond	1,000
Fayette, Cooper's pond	1,500
Darden's pond	100
Georgetown, Catching's pond	1,000
Gulfport, Bayou Bernard	420
Biloxi River	180
Little Biloxi River	350
Tchouticabouffa Creek	300
Guntown, Elk View Lake	†2,000
Epting's pond	†1,000
McCarley's pond	†3,000
Hazlehurst, Ellis's pond	†1,000
Lake Hazel	160
Lake Catherine	†1,000
Marchetti Lake	† 500
Tally Lake	†1,500
Hernando, Banks's pond	50
Holcomb, Staten Pond	1,000
Houston, Houston Pond	†3,000
Jackson, Hendricks's pond	35
Jones's ponds	1,000
Williams's pond	1,000
Willow Pond	1,000
Kosciusko, Bailey Lake	2,000
Sunnyside Valley Pond	1,000
Laurel, Vinson's pond	100
Learned, Gibbes's pond	†1,000
Lucedale, Sunset Lake	100
Lucien, Lofton's pond	125
Lyman, Day's Pond	1,000
Maben, Turner's pond	1,000
Macon, Bryson Pond	45
McHenry Lake	45
McIntosh Lake	45
Oil Mill Pond	25
Patty Lake	45
Raney Pond	45
Robbins Pond	45
Scott Lake	70
Mayhew, Finklea Pond	25
Gaiths Reese Pond	50
McCollum's pond	45
Warren Pond	25
Meridian, Reed Breakwater Pond	1,000
Wagner Pond	1,500
Muldrow, Muldrow Pond	1,000
Neshoba, Livingston's pond	500
Newton, Doolittle's pond	1,000
Okolona, Lake Carrie Miller	200
Oxford, Hudleton Pond	1,500
Pass Christian, Arcadian Bayou	†5,000
Patterson, Beautiful Pond	†1,000
Pheba, Jordan's pond	300
Prentiss, Herron's pond	500
Raymond, Newman's pond	500
Richton, Smith's pond	100
Ripley, Jefferies Pond	80
Yancy's pond	40
Selma, Big Pond	†1,500
Little Pond	1,000
Senatobia, Koff Pond	50

a Rescued from overflowed lands and restored to original waters.

Distribution of fish and eggs, fiscal year 1918—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Number.
Mississippi—Continued.	
Shuqualak, Whitfield Pond	†3,000
Silver City, Atchafalaya Bayou	125
Fish Lake	100
Silver Creek Lake	125
Soso, Sumrall's pond	1,000
Starkville, Pearson's pond	50
Pine Ridge Pond	25
Sumrall, Hemba's pond	1,000
Torrance, McCormack's pond	100
Tupelo, Bakers Lake	300
Utica, Lake John Sharp Williams	1,500
Vaiden, Rural Glade Pond	1,000
Vardaman, Inmon's pond	50
Waynesboro, Easterling's pond	80
Limestone Pond	†5,000
Tatums Pond	80
Wenasoga, Hammon's pond	†2,000
West, Maple Leaf Lake	1,000
Woodland, Bermuda Pond	80
Lake Maurice	500
Sissons's pond	1,000
Yazoo City, Open Lake	150
Missouri:	
Baring, Santa Fe Lake	450
Birch Tree, Current River, Jacks Fork	720
Chula, Medicine Creek	625
Clayton, Chaminade Lake	75
Hogan's pond	75
Columbia, Adenhill Lake	170
Gordon Lake	510
Grindstone Creek	510
Johnson's pond	170
Perche River	510
DeSoto, Murphy Lake	60
Excelsior Springs, Crescent Lake	300
Wale's pond	300
Gilliam, Alton Slater Lake	200
Waterworks Pond	200
Higginsville, Confederate Ponds	400
High Hill, Wabash Lake	120
Independence, Swinney's pond	400
Woods Lake	500
Ironton, Lake Killarney	75
Joplin, Coalbrook Lake	300
Jones Creek	300
Muennig Lake	200
Kansas City, Julian's pond	200
Lamar, Spring River, North Fork	300
Lathrop, Lake Benson	300
Macon, Osteopathic Lake	60
Martin, Merryvale Lake	400
Mindenmines, Bunce's pond	150
Nevada, Marmaduke Park Pond	340
New London, Salt River	375
Oasis, Fish Slough Lake	520
Otterville, Bryans Run	300
La Mine River	300
Pleasant Hill, Baldwin Lake	300
Rocheport, Manitcau Creek	510
Rolla, Big Piney River	100
St. Clair, Hagebusch's pond	75
St. Louis, Ackerman's pond	180
Shelbina, Salt River	90
Washington, Busch's pond	75
Montana:	
Cascade, Squaw Lake	300
Malta, Horseshoe Lake	500
Wilson's pond	200
Miles City, Yellowstone River	1,400
Plentywood, Brush Lake	300
Nebraska:	
Fort Robinson, Cass Lake	390
Prague, Wagner's pond	195
Ruskin, Goldbeck's pond	175
St. Paul, Gans's pond	175
Sutton, Pleasant View Pond	350
Wayside, Baird's pond	585
Farview Lake	390
Willow Pond	338
New Hampshire: Chesham, Russell's pond	60
New Jersey:	
Burlington, Delaware River	4
Chatsworth, Reeves Branch	4
Crawford, Bloodgood Pond	80
Rahway River	80
Gibbstown, Third Ditch Creek	20
Hackettstown, State fish commission	200
Mountain Lake, Hillcrest Lake	160
Mountain Lakes	120
Wildwood Lake	120
Newfoundland, Green Pond	120
Oakland, Ramapo Lake	120
Penns Grove, Layton Lake	10
Phillipsburg, Delaware River	160
Salem, Woodmere Camp Lake	20
South Dennis, Beaverdam Pond	8
Westwood, Adjustina Lake	40
New Mexico:	
Clayton, Eklund's pond	120
Pawley Pond	120
Des Moines, Corrumpa Creek	120
Engle, Lake B. M. Hall	200
Kenna, Jones's pond	75
Maxwell, Holkeo Creek	80
Onava, Deep Lake	120
La Jara Lake	120
Lower Armstrong Lake	80
Tip Lake	80
Roswell, Mule Shoe Lake	75
Springer, Village Storage Lake	80
New York:	
Cambridge, Hedges Lake	225
Cattaraugus, Conewango Creek	450
Spring Pond	150
Clayton, St. Lawrence River	600
Collins, Hospital Pond	300
Conewango, Conewango Creek	450
Elmira, Chemung River	375
Fishkill, Brinckerhoff Pond	60
Fulton, Paddy Lake	750
Goshen, Sunnydale Lake	30
Gouverneur, Pleasant Lake	450
Holley, Beebe's pond	150
Kennedy, Conewango Creek	450
Lake Mahopac, Kirk Lake	30
Livingston Manor, Hunter Lake	150
Lockport, Tonawanda Creek	750
Locust Valley, Factory Pond	120
Lyons, Canandaigua Creek	300
Ganargua Creek	300
Lime Lake	1,050
Newark, Coffey Lake	500
Newburgh, Northview Lake	90
Niskayuna, Mohawk River	375
Oswego, Oswego River	600
Palmyra, Barge Canal	600
Mud Creek	100
Red Creek	300
Pine Bush, Hillcrest Pond	30
Port Henry, Lake Champlain	375
Richfield, Canadargo Lake	200
Salisbury Center, Cranberry Marsh Lake	200
Spruce Lake	500
Salisbury Mills, Ransdell Pond	225
Water Mill, Lake Nowedma	120
North Carolina:	
Aulander, Lightwood Knot Mill Pond	†1,200
Bryson City, Deep Creek	1,500
Tudkaseigee River	2,000
Burlington, Bellmont Lake	800
Big Alamance Pond	800
Richards Mill Pond	800
West Piedmont Pond	125
Canton, Pigeon River	3,500
Cary, Holleman's pond	300
Charlotte, Collins's pond	1,200

Distribution of fish and eggs, fiscal year 1918—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Number.
North Carolina—Continued.	
Clinton, Big Coharie Creek	†1,200
Six Runs	†1,200
Concord, Crowell's pond	1,500
Richie Pond	1,000
Edenton, Little Creek	1,300
Pembroke Creek	†1,500
	2,000
Elkin, Darnall Pond	125
Elkton, Smith Mill Pond	1,500
Fayetteville, Buckhead Pond	2,500
Victory Lake	2,000
Flat Rock, Highland Lake	675
Greensboro, Shady Dell Pond	400
Hartford, Skinners Creek	†1,500
High Point, Marsh Branch Pond	75
Spring Branch Pond	150
Jacksonville, New River	†1,200
Kannapolis, Lee's pond	1,000
Lake Junaluska, Lake Junaluska	2,500
Lexington, Brushy Fork Creek	750
Littleton, Warrens Pond	†1,200
Marshville, Williams's pond	1,350
Mayworth, Mays Mill Pond	1,300
Monroe, Helms's pond	40
Murphy, Cane Creek	1,000
Hiawassee River	1,500
Notla River	1,500
Valley River	1,500
Newport, Lake Oxley	†1,200
North Wilkesboro, Whittington's pond	125
Oakboro, Running Branch Lake	600
Pisgah Forest, Engadine Pond	125
Raleigh, Hood Mill Pond	†1,500
Red Springs, Browns Lake	1,500
Ridgeway, Hecht's pond	†600
Rockingham, Marks Creek	2,025
Silver Run Pond	2,700
Rutherfordton, Rocky Broad River	1,200
Selma, Little River	†1,200
	300
Skyland, Ray's pond	1,000
Smithfield, Holts Pond	†1,500
Sylva, Tuckaseigee River	2,500
Tarboro, Bridgers's pond	†900
Lake Parks	†900
Nobles Mill Pond	†900
Shock's pond	†900
Tar River	†900
Troy, Little River	1,000
Wagram, Shoe Hell Creek Pond	100
Warren Plains, Largo Pond	†1,200
Lees Branch Pond	†1,200
North Dakota:	
Dazey, Ensign Lake	420
Marston, Lake Williams	350
Petrel, Lemmon Lake	500
St John, Lakes of Rolette County	4,060
Ohio:	
Akron, Rex Lake	300
Alliance, Country Club Lake	300
Bridgeport, Deep Run	140
Fairpoint Pond	100
Glens Run	100
Wheeling Creek	140
Brokaw, Muskingum River	200
Caledonia, Whetstone Creek	225
Cambridge, Waterworks Lake	100
Canton, Isler Pond	150
Timken Lake	150
Carey, Tymochtee Creek	225
Chillicothe, Paint Creek	750
Paint Creek, North Fork	250
Cleveland, Bass Lake	500
Creston, Mud Lake	200
Dayton, Stillwater River	200
Earlville, Boettler's pond	300
Easton, Davidson Lake	300
Galion, Sandusky River	300

Disposition.	Number.
Ohio—Continued.	
Greenfield, Maple Grove Pond	100
Houston, Evergreen Lake	100
Lancaster, Crook's pond	100
Lemert, Sycamore Creek	225
Ludlow Falls, Stillwater Creek	150
Mount Oreb, White Oak Creek	150
Newton Falls, Milton Lake	8,800
Paulding, Miller Gravel Pond	200
Sugar Factory Pond	200
Powell, Willow Lake	225
Salem, Beaver Creek, Middle Fork	225
Mahoning Lake	225
Sylvan Brook	100
Swifts, Muskingum River	200
Tiffin, King Lake	225
Wapakoneta, Dixon Pond	50
Waterford, Muskingum River	300
Wellington, Waterworks Pond	400
West Mansfield, Mill Creek	150
Van Cleve Pond	150
West Milton, Stillwater River	200
White Sulphur, Lake Bird	150
Woodfield, Little Muskingum River	150
Oklahoma:	
Altus, Clay Lake	130
Ardmore, Ardmore Lake	40
Brushy Creek	80
City Lake	80
Club Lake	120
Dunlap's pond	40
Flood Creek	40
Lone Grove Lake	40
Mill Creek	40
Byars, Byars Lake	80
Cherokee, Allen Lake	35
Cheyenne, Willow Pond	430
Cordell, Ogle Lake	24
Rose's pond	24
Shepard Lake	12
Cog, Fish Hole Creek	300
Gage, Buzzard Roost Lake	325
Pasture Lake	130
Spring Lake	195
Goteba, Grigsby's pond	35
Grandfield, Porters Pond	260
Guthrie, Wiggins Pond	40
Hillsdale, Cox's pond	35
Hugo, Cut Off Lake	550
Inola, Scaley Bark Pond	50
Kingfisher, Big Kingfisher Lake	105
Kosoma, Miller Lake	275
Lookeba, Wilson Creek	12
McAlester, Bevo Lake	150
Lake Talawanda	200
Medford, Falkenberg's pond	24
Mooreland, Ruttman Lake	130
Mountain View, Buffalo Creek	8
Cottonwood Creek	4
Fisher Lake	4
Goom-do Creek	8
Medicine Creek	8
Oak Creek	4
Otter Creek	8
Pecan Creek	8
Rainy Mountain Creek	4
Saddle Mountain Creek	4
Stinking Creek	8
Sugar Creek	4
Taylor Creek	8
Muskogee, Sondheimer's pond	150
Oklahoma City, Belle Isle Lake	80
Phillips Lake	12
Waldon Lake	40
Orlando, Johnson's pond	40
Owasso, Owasso Lake	150
Pawhuska, Mission Creek	100
Perry, City Lake	40
Country Club Lake	40
McCinstry Lake	40

Distribution of fish and eggs, fiscal year 1918—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Number.
Oklahoma—Continued.	
Perry, Mullnix Lake	40
Perry Creek	40
Perry Lake	40
Pittsburg, Allen Lake	50
Pond Creek, Manning Creek	70
Poteau, Clear Lake	300
Stalcup Lake	300
Robbins, Illinois River, Barren Fork	1,250
Roosevelt, Cooperton Lake	72
Otter Creek	24
Sugar Creek	24
Stillwater, Parks's pond	6
Spring Valley Lake	6
Thatcher's pond	12
Strong City, Lake George	130
Spring Creek Pond	65
Tulsa, Glenn Lake	50
Vinita, Clear Lake	100
Jones Creek	100
Little Cabin Creek	100
Mustang Creek	50
Paw Paw Creek	50
Rock Creek	200
West Cabin Creek	100
White Oak Creek	50
Waurika, Stewart Lake	18
Welch, Little Cabin Creek	150
Weatherford, Cedar Creek	120
Spring Branch	120
Woodward, Dripping Spring Run	65
Ellington Lake	65
Fithen Lake	130
Hastings Lake	130
Jones Lake	65
Kollar's pond	130
Pitt Lake	130
Roundup Pond	65
Scates Lake	130
Spring Lake	130
Stiller Lake	130
Wyatt Lake	130
Wyatt Pond	65
Zahner Lake	65
Yost, Stillwater Lake	12
Yost Lake	12
Pennsylvania:	
Alderson, Harvey Lake	300
Altoona, Juniata River	4,400
Beaver, Big Beaver Creek	200
Little Beaver Creek	150
Raccoon Creek	100
Beaver Falls, Little Beaver Creek	150
Bellefonte, Bald Eagle Creek	400
Birdell, Brandywine Creek, West Branch	100
Bryn Athyn Station, Pennypack Creek	375
Cambridge Springs, Edinboro Lake	12
Canton, Lake Nepahwin	900
Carlisle, Conodoguinit Creek	500
Cessna, Dunning Creek	100
Chadds Ford, Patterson's pond	100
Christiana, Octoraro Creek	1,000
Columbia, Susquehanna River	500
Denver, Cocalico Creek	200
Denver Park Pond	100
Leeds Run	100
Losher-Raig Pond	100
Swamp Creek	100
Dudley, Siding Hill Creek	20
East Berlin, Beaver Creek	250
Conewago Creek	250
Easton, Delaware River	400
Everett, Juniata River, Raystown Branch	680
Fallen Timber, Slate Run	420
Falls, Island Eddy Pond	300
Norris Lake	200
Susquehanna River	300
Swartwood Eddy Pond	300
Pennsylvania—Continued.	
Franklin, Allegheny River	280
French Creek	300
Hanover, Big Conewago Creek	375
Little Conewago Creek	500
Holidaysburg, Juniata River	150
Hosensack, Hosensack Creek (Dam No. 5)	550
Hosensack Creek (Dam No. 6)	450
Leibert Creek Pond	200
Huntingdon, Juniata River, Raystown Branch	1,300
Hyndman, Wills Creek	40
Johnstown, Dubstalts Pond	140
Hinckson Pond	140
Laurel Run Pond	140
Quemahoning Pond	210
Stony Creek	210
Lancaster, Conestoga Creek	375
Little Conestoga Creek	250
Lewisburg, Buffalo Creek	750
Chillisquaque Creek	375
Kratzerville Pond	375
Sampsell Pond	375
Lititz, Bricker's pond	100
Bucher Run	100
Conestoga Creek	400
Hammer Creek	200
Hammer Creek Pond	100
Rudy Run	100
McKeesport, Long Run	300
Mechanicsburg, Conodoguinet Creek	500
Mifflinburg, Penns Creek	375
Montrose, Bigsbee Pond	200
Forest Lake	200
Lake Mt. Rose	200
Muncy, Muncy Creek	500
Nanty Glo, Rager Run	100
New Bloomfield, Sherman Creek	150
New Brighton, Little Beaver Creek	150
Newport, Big Buffalo Creek	300
Nuangola, Lake Nuangola	300
Peach Bottom, Susquehanna River	750
Pen Argyl, Johnsonville Pond	200
Saylor Lake	200
Susquehanna River	375
Perkasie, Branch Creek	100
Phoenixville, French Creek	625
Pickering Creek	375
Pittston, Susquehanna River	1,300
Quakertown, Swamp Creek	200
Quarryville, Conowingo Creek	375
Octoraro Creek	375
Ransom, Susquehanna River	200
Rauschs, Rauschs Pond	375
Reading, Beaver Creek	100
Rock Forest, Susquehanna River	500
Rohrestown, Little Conestoga Creek	375
Royersford, French Creek	250
Kimberton Pond	125
Mill Dam Pond	125
Stony Run	500
St. Clair, Kaufman Pond	250
South Danville, Susquehanna River	600
Standing Stone, Spring Lake	400
Thompson, Wrighter Lake	500
Towanda, Susquehanna River	500
West Grove, Mitchell's Lake	100
White Clay Creek	200
Wind Ridge, Crow Creek	200
Wheeling Creek	200
Woodlawn, Raccoon Creek	150
Wyalusing, Susquehanna River	24
Wyoanna, Susquehanna River	300
South Carolina:	
Aiken, Franklin's pond	24
Hendrix's pond	500
Angelus, Rocky Branch Pond	2,700
Rocky Creek	2,700
Barnwell, Cheat Cave Pond	450
Belton, Spring Pond	200

Distribution of fish and eggs, fiscal year 1918—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Number.
South Carolina—Continued.	
Bennettsville, David's pond	3,000
Calhoun, Rocky River	2,000
Camden, Hermitage Pond	88
Cameron, Fogle Pond	750
Groner's pond	1,000
Columbia, Goodwill Pond	2,500
Florence, Muidrow Mill Pond	3,000
Pee Dee Lake	600
Gaffney, Cash's pond	300
Gilbert, Black Creek	1,500
Keisler's pond	500
Shumbert's pond	1,500
Greenville, Croft-Stone Lake	1,500
Saluda River	1,500
Stone's pond	1,500
Lexington, Clemens Creek Pond	2,500
Livingston, Turkey Branch Pond	1,000
Mara Bluff, Black Creek	2,500
Monetta, Mill Creek Pond	400
Montmorenci, Corliss's pond	3,900
Mount Groghan, Short's pond	1,000
Newberry, Cannon Creek	400
North, Jones's pond	300
Orangeburg, Edisto River	1,900
Fishery Branch	4,440
Wannamaker's pond	1,200
Zeigler's pond (A)	3,300
Zeigler's pond (B)	2,700
Pageland, Sand Hill Pond	1,000
Pickens, Keowee River	500
St. Matthews, Warley Creek	1,000
Sharon, Thomson's pond	600
Sumter, Brickyard Ponds	3,000
Wells Pond	300
Trenton, Asparagus Pond	3,000
Beaverdam Pond	4,500
Bettis's mill pond	2,250
Brunts Pond	3,750
Leonck's pond	2,250
Moss's mill pond	3,750
Union, George Sims Pond	300
Wagener, Big Branch Pond	400
Walhalla, Whitewater River	1,800
Ward, Watson's pond	2,000
Warrenville, Horse Pen Creek	2,500
Wedgefield, Dwight's pond	2,100
Singleton's pond	3,000
South Dakota:	
Blunt, Farmers Lake	300
Colome, Dog Ear Lake	350
Herreid, Spring Creek	400
Hot Springs, Ice Company Pond	350
Mansfield, Willowmere Lake	200
Martin, Lake Creek	390
North Cody Lake	390
Midland, Sunny Lake	300
Milbank, Whetstone River	500
Parkston, Wahl's pond	200
Sioux City, Waters of South Dakota	1,050
Tyndall, Marys Lake	200
Tennessee:	
Arlington, Cunningham's pond	72
Ashland City, Sycamore Creek	150
Atoka, Kimbrough's pond	400
Boliver, Emerson Pond	30
Bristol, Holston River	225
Cedar Hill, Ravenswold Pond	500
Chattanooga, Lake View	300
Lookout Lake	†500
Rock Creek	†500
Chesterfield, Manness's pond	900
Coal Creek, Coal Creek	†2,000
East Chattanooga, Bauxite Lake	500
Etowah, Cane Creek Pond	†2,000
Fayetteville, Cane Pond	†3,000
Elk River	†3,000
Norris Creek	†4,000
Franklin, Harpeth River	†4,000
West Harpeth River	†3,000

Disposition.	Number.
Tennessee—Continued.	
Gallatin, De Sha Creek	†7,000
Hickory Valley, Avent's pond	†3,000
Lexington, Hare's pond	20
Lone Mountain, Big Sycamore Creek	†2,000
McKenzie, Clear Lake	2,000
McMinnville, Red Road Lake	1,000
Mayland, Mountain Lake	3,500
Normandy, Isom's pond	†2,000
Oneida, Cumberland River, South Fork	†4,000
White Oak Creek	†5,000
Pulaski, Egnew Creek	†2,000
Weakley Creek	†2,000
Rogersville, Beech Creek	†2,000
Caney Creek	†2,000
Sale Creek, Sale Creek	300
Selmer, Sunnyside Lake	150
Shelbyville, Duck River	500
Springfield, Powell's pond	†2,000
Sweetwater, Fork Creek	†500
Pond Creek	†500
Sweetwater Creek	†500
Tullahoma, Hurricane Creek	†3,000
Mulberry Creek	†3,000
Walling, Robertson's pond	†2,000
Wartrace, Duck River, Garrison Fork	†3,000
Wartrace River	†3,000
Watertown, Fall Creek	†3,000
Wetmore, McLendon's pond	†1,000
Winchester, Collins Pond	†1,500
Utah: Ogden, Winter's pond	100
Virginia:	
Abert, James River	170
Appomattox, Appomattox River	500
Barboursville, Woodroof's pond	150
Blacksburg, Dobson's pond	300
Blackwood, Powder House Pond	50
Blaine, Blackwater Creek	225
Buffalo Forge, Bunker Hill Mill Pond	55
Camp Stephens, Chestnut Creek	200
Cripple Creek	200
Crooked Creek	300
New River, Knox Fork	200
Poplar Camp Creek	200
Castlewood, Clinch River	300
Cedar Bluff, Clinch River	300
Little River	200
Cohoke, Cohoke Pond	400
Pollard Pond	230
Danville, County Line Creek	825
Harper's pond	1,200
Delvale, Coxes Creek	300
Dixondale, Burk Mill Pond	†5,000
Dundas, Great Creek Pond	1,300
Neblett Pond	900
Elkton, Shenandoah River	60
Emporia, Meherrin River	525
Yarrell Mill Pond	300
Ewing, Indian Creek	120
Fredericks Hall, Sherman Pond	300
Fremont, Cranes Nest River	†2,000
McCleery River	†2,000
Fries, New River	300
Goodview, Virginia Railway Lake	250
Gretna, Fitzgerald's pond	150
Haysi, Pound River	†2,000
Hot Springs, Jackson River	55
Keezletown, Shenandoah River	110
Kiser, Clinch River	300
Koehler, Smith River	400
Lexington, Big Buffalo Creek	5
Lodge, Willowdale Pond	140
Maplewood, Cedar Pond	300
Mount Jackson, Shenandoah River, North Fork	40
New Castle, Craig Creek	115
Norfolk, City Lake	420

Distribution of fish and eggs, fiscal year 1918—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Number.
Virginia—Continued.	
Norfolk, Elizabeth River	975
Little Creek Pond	†2,100
	1,000
Norton, Guest River	100
Powell River, Middle Fork	750
Powell River, South Fork	400
Paint Bank, Potts Creek	300
Pamplin, Almond Mill Pond	400
Pemberton, Trice Pond	375
Pembroke, Mountain Lake	650
Penn Laird, Cub Run	55
Penola, Dublin Mill Pond	300
Gwathmay's pond	200
Philpot, Smith River	225
Pisgah, Clinch River	100
Port Royal, Walsingham Pond	110
Remlik, Dragon Creek	120
Richmond, Association Pond	1,200
Belle Isle Road Pond	400
Broad Rock Pond	560
Bryan Park Pond	625
Captain Joes Pond	1,300
Carters Pond	200
Goyne's pond	200
Lakeside Lake	1,000
Licking Creek Pond	400
Northside Lake	400
Reddy Creek Pond	600
Spring Brook Pond	600
Woodson's pond	300
Riverside, South River	55
Rocky Mount, Pigg River	225
Salem, Roanoke River	115
Scottsville, Payne Pond	225
Shawsville, Roanoke River, South Fork	300
South Boston, Bruce's pond	975
Cedar Heights Pond	50
Speedwell, Elk Creek	300
Stanley, Back Creek	225
Staunton, Middle River	120
Stuart, Rockcastle Creek	300
Suffolk, Box Elder Pond	225
Norfleet Mill Pond	225
Sweet Hall, Custis Lake	500
Swords Creek, Clinch River, Maiden Spring Fork	800
Tappahannock, Croxton Mill Pond	120
Tazewell, Clinch River, East Fork	300
Timber Ridge, North River	5
Troutdale, Fox Creek	300
Wilson Creek	300
Walker Ford, James River	225
Warren, Tapscott's pond	225
Wellville, Crows Pond	300
Wheeler, Butchers Branch	60
Indian Creek	60
Windsor, Horne's pond	225
Wytheville, Cove Creek	100
West Virginia:	
Berkeley Springs, Sleepy Creek	700
Clarksburg, Oral Lake	1,000
Clay, Elk River	28
Little Laurel Creek	21
Great Cacapon, Cacapon River	120
Hurricane, Big Hurricane Creek	40
Moorefield, Potomac, South Fork	35
New Martinsville, Fishing Creek	150
Pax, Paint Creek Pond	110
Phillipi, Whitman Run Pond	100
Wisconsin:	
Alma, State fish commission	3,425
Aniwa, Pleasant Lake	100
Resch Lake	100
Spring Lake	100
Bagley, Mississippi River	a 1,000
Baraboo, Dell Creek	150
Ellendale Lake	50

Disposition.	Number.
Wisconsin—Continued.	
Baraboo, Fern Dell Lake	50
Gray Lake	75
Mirror Lake	150
Narrows Lake	275
Pickerel Lake	75
Ringling Lake	100
Smith's pond	75
South Slew Lake	50
Spring Brook Lake	200
Timmes Mill Lake	75
Twin Lake	150
Beaver Dam, Beaverdam Lake	550
Black River Falls, Black River	350
Douglas Lake	350
Mud Lake	175
Rock Lake	175
Steblin Lake	175
Bloomer, Axe Handle Lake	100
Booth Lake	100
Carnell Lake	50
Chain Lake	50
Clear Lake	50
Lake Como	50
Little Rice Lake	50
Long Lake	100
Potato Lake	100
Round Lake	50
Shattuck Lake	100
Bowler, Kolpeck Lake	100
Brokaw, Wisconsin River	300
Centuria, Deer Lake	300
Chippewa Falls, Davis Lake	200
O'Neil Creek	125
Popple Lake	150
Wissota Lake	125
Conover, Portage Lake	160
Stormy Lake	80
Cumberland, Wildcat Lake	150
Darlington, Pecatonica River	170
Donaldson, Landing Lake	100
Little Portage Lake	100
Moon Lake	200
Round Lake	100
Durand, Bear Lake	375
Tompson Lake	375
Eggleston Crossing, Waits Lake	150
Eland, Mayflower Lake	100
Elkhart Lake, Crystal Lake	300
Elkhart Lake	400
Elk Mound, Colfax Lake	700
Fall Creek, Fall Creek	350
Fond du Lac, Fifteen Lake	120
Lake DeNeveu	120
Long Lake	120
Mullet Lake	120
Round Lake	120
Twin Lake	120
Fredonia, Milwaukee River	500
Galesville, Lake Marinuka	500
Gordon, Bond Lake	225
Bony Lake	150
Ox Lake	50
Spider Lake	50
Swensen Lake	50
Grand Rapids, Wisconsin River	1,831
Hartford, Mud Lake	300
Murphy Lake	300
Pike Lake	300
Hawthorne, Minnesung Lake	200
Hayward, Alexander Lake	100
Barber Lake	50
Bass Lake	100
Belille Lake	50
Blanche Lake	50
Chief Lake	100
Clear Lake	50
Como Lake	50
Fischer Lake	100

a Rescued from overflowed lands and restored to original waters.

Distribution of fish and eggs, fiscal year 1918—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Number.
Wisconsin—Continued.	
Hayward, Fulton Lake	100
Glover Lake	100
Gordon Lake	50
Hammond Lake	100
Harriet Lake	50
Jirrard Lake	50
Lake George	100
Moore Lake	50
Pike Lake	100
Shue Lake	50
Uneida Lake	50
Wilson Lake	100
Hazelhurst, Wind Pudding Lake	100
Heafford, Rice Lake (A)	100
Rice Lake (B)	200
Independence, Bugle Lake	255
Elk Lake	170
Iron River, Crystal Lake	200
Kilbourn, Wisconsin River	300
La Crosse, Mississippi River	a 1,415
Ladysmith, Flambeau Pond	300
Mud Lake	100
Park Lake	200
Lake Geneva, Lake Geneva	340
Manitowoc, English Lake	25
Gass Lake	25
Gateman Lake	25
Glombsky Lake	50
Harp Lake	50
Hartlaub Lake	50
Hempton Lake	25
Kastbaum Lake	25
Pigeon Lake	50
Schisel Lake	25
Silver Lake	50
Vetting Lake	50
Mattoon, Baker Lake	75
Heiberlein Lake	75
Johnson Lake	75
Mauston, Lemonweir River	200
Mellen, Bass Lake (A)	50
Bass Lake (B)	50
Beaver Lake (A)	100
Beaver Lake (B)	50
Birch Lake	100
Bladder Lake	100
Clear Lake (A)	50
Clear Lake (B)	50
Duck Lake	50
English Lake	50
French Lake	100
Graham Lake	50
Hoist Lake	50
Lake Eighteen	50
Lost Lake	50
McCarty Lake	100
Miller Lake	50
Mineral Lake	100
Munson Lake	50
Murphy Lake	50
Potter Lake	50
Rice Lake	50
Spider Lake	50
Spring Lake	100
Summit Lake (A)	100
Summit Lake (B)	50
Menomonie, Caryville Lake	100
Cedar Falls Lake	200
Doyle Lake	100
Eighteen Mile Lake	100
Goose Lake	100
Hay River	250
Lake Menomonie	100
Miller Lake	100
Moore Farm Lake	100
Mud Lake	100
Pitt Lake	100
Red Cedar River	200
Rowe Lake	100

Disposition.	Number.
Wisconsin—Continued.	
Menomonie, Stump Lake	100
Waubeek Lake	100
Wilson Lake	100
Merrill, Ackerman Lake	25
Bass Lake	25
Black Alder Lake	25
Daniels Lake	50
Hitchlee Lake	25
Lake Pesobic	50
Lost Lake	25
Pine Lake	25
Silver Lake	25
Tug Lake	25
Winkleman Lake	25
Wisconsin River	75
Neshkoro, Turtle Lake	200
New Auburn, Chain Lake	200
Norrie, Cancer Lake	75
Horsehead Lake	75
Lake Go To It	75
Long Rice Lake	75
Mayflower Lake	75
Mud Lake	75
Norrie Lake	75
Pike Lake	75
Range Line Lake	75
Rice Lake	75
Road Lake	75
Short Portage Lake	75
Small Bass Lake	75
Small Mayflower Lake	75
Turtle Lake	75
Twin Lake	75
Wild Rose Lake	75
Yellow Banks Lake	75
Pembine, Lost Lake	110
Rock Lake	100
Smith Lake	100
Phillips, Big Elk River	100
Cranberry Lake	50
Dardis Lake	100
Deer Lake	50
Elk Lake	50
Flambeau River, South Fork	100
Grassy Lake	100
Lake Duray	50
Little Daris Lake	50
Little Elk Creek	100
Long Lake	50
Poynette, Hinckson Creek	200
Poynette Mill Pond	100
Rowan Creek	150
Reserve, Grindstone Lake	200
Lac Court Oreilles	300
Rhinelander, Bass Lake	100
Ben Sweet Lake	100
Boom Lake	100
Faust Lake	100
Lake George	100
Lake Julia	100
Lake Thompson	100
North Pelican Lake	150
Pearl Curran Lake	50
Pine Lake	100
Shepard Lake	100
Town Line Lake	100
Wisconsin River	100
Rib Lake, North Spirit Lake	300
Richland Center, Bowen Mill Pond	250
Brown Lake	125
Cazenovia Mill Pond	125
Crueson Pond	250
Excelsior Mill Pond	125
Ithica Mill Pond	125
Lone Rock Mill Pond	250
Neptune Mill Pond	250
Postel Lake	250
Richland Center Mill Pond	250
Shawano, Keshena Lake	100

a Rescued from overflowed lands and restored to original waters.

Distribution of fish and eggs, fiscal year 1918—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Number.
Wisconsin—Continued.	
Sheboygan, Lake Seven	100
Pigeon River	100
Sheboygan Falls, Lake Ellen	100
Pigeon Lake	200
Solon Springs, Beauregard Lake	100
Lake of the Woods	50
Rocky Lake	200
Stone Lake, Hungry Lake	400
Snag Lake	100
Superior, Amnicon Lake	70
Bingo Lake	40
Boscoe Bay Lake	40
Bubar Lake	40
Clubine Lake	40
Crow Lake	40
Eagle Lake	40
Five Island Lake	40
Heart Lake	40
Huber Lake	40
Lake Millicent	40
Lost Lake	40
Lower Pike Lake	40
Mary Lake	40
Pike Lake	40
Twin Lakes	40
Three Lakes, Butternut Lake	100
Franklin Lake	100
Tomahawk, Bass Lake	50
Clear Lake	100
Deer Lake	100
Half Moon Lake	100
Wisconsin—Continued.	
Tomahawk, Lake Clara	50
Manson Lake	50
Mirror Lake	50
Mud Lake	50
Muscalonge Lake	100
Road Lake	50
Round Lake	50
Somo Lake	50
Somo River	50
Spirit River	50
Tomahawk River	50
Wisconsin River	50
Wabeno, Ada Lake	300
Waldo, Lake Ellen	300
Watertown, Richwood Quarry Pond	300
Wausau, Big Rib River	150
Lake Go To It	165
Lake Wausau	54
Mud Lake	100
Webster, Yellow Lake	200
Winegar, Crab Lake	200
Wyoming:	
Cheyenne, Lake Minnehaha	175
Sloans Lake	350
Worland, Worland's pond	175
Canal Zone: Gatun Lake, Gatun Lake	1,000
Mexico: Parral, Lake Conchos	750
Total[a]	†283,500 970,020

SMALLMOUTH BLACK BASS.

Arkansas:	
Abbott, Petit Jane Creek	250
Cauthron, Poteau River	236
Harrison, Bear Creek	229
Crooked Creek and Branches	686
Huzzah Creek	229
Shain, Little Red River	228
Shirley, Red River	228
Waldron, Dutch Creek	413
Fourche Creek	236
Van Buren, Cotton Lake	300
Colorado: Wray, Club Lakes	250
Connecticut:	
Niantic, Cedar Lake	83
Norfolk, Doolittle Pond	50
Smith Pond	50
Norwich, Ashland Pond	150
Beach Pond	75
Billings Lake	75
Gardner Lake	75
Hayward Lake	75
Long Pond	75
Oxoboxo Lake	75
Pachaug Pond	75
Rogers Lake	75
Winsted, Highland Lake	100
Indiana:	
Angola, Lake James	†4,000
Loon Lake	1,000
Brazil, Cooper's pond	†1,500
Columbia City, Shriner Lake	1,000
Culver, Bess Lake	1,500
Lake Maxinkuckee	2,500
Howe, Pigeon River	†4,000
Huntington, Clear Creek	†2,000
Little River	†3,000
Rock Creek	†2,000
Salamonie River	†3,000
Wabash River	†4,000
Indianapolis, Eagle Creek	1,500
White River	1,500
Kendallville, Adams Lake	1,000
Fish Lake	†3,000
Indiana—Continued.	
Kendallville, Pretty Lake	†3,000
Knox, Bass Lake	†5,000
Kokomo, Leach's pond	†1,500
Logansport, Eel River	†4,000
Orland, Wall Lake	1,000
Richmond, Durley's pond	500
Rolling Prairie, Sagunay Lake	1,000
Iowa:	
Earlville, Plum Creek	300
Independence, Wapsipinicon River	300
Jessup, Wapsipinicon River	200
Kentucky:	
Cadiz, Little River	350
Erlanger, Lake Park	200
Georgetown, Elkhorn Creek	2,100
Flemingsburg, Fleming Creek	900
Hopkinsville, Little River and branches	1,050
Oak Grove Pond	150
Pond River	375
Red River, West Fork	375
Sinking Fork Creek	250
Maine:	
Ayers Junction, Meddybemps Lake	50
Eliot, Great Works River	†2,000
York Pond	†2,000
Oakland, Little Pond	40
North Pond	50
Salmon Lake	40
Maryland:	
Baltimore, State Ponds	88
Cockeysville, Old Beaverdam Pond	1,800
Dickerson, Potomac River	925
Gaithersburg, Potomac River	†10,000
Glen Echo, Potomac River	850
Havre de Grace, Susquehanna River	400
Hollins, Lake Roland	1,500
Massachusetts:	
Ashburnham, Naukeag Lake	†3,000
Dover, Pegan Hill Pond	†3,000
Great Barrington, Lake Mansfield	30
Prospect Lake	30

[a] Exclusive of 8,445 fingerlings lost in transit.

Distribution of fish and eggs, fiscal year 1918—Continued.

SMALLMOUTH BLACK BASS—Continued.

Disposition.	Number.
Massachusetts—Continued.	
Harvard, Farm Pond	†1,000
Hudson, Lake Boon	325
Lenoxville, Laurel Lake	90
Lowell, Tyngs Pond	†2,000
Plymouth, Rabbit Pond	200
Shelburne Falls, Ashfield Pond	30
Deerfield River	30
Gardner Falls Lake	30
Reservoir No. 2	30
Reservoir No. 4	30
Southbridge, Greenwood Farm Pond	†2,000
West Barnstable, Indian Pond	200
Long Pond	200
Wequaquet Lake	200
West Medway, Medway Park Pond	†2,000
Michigan:	
Atlanta, Dishaw Lake	1,500
Rush Lake	1,500
Valentine Lake	1,400
Beechwood, Lake Five	280
Benton Harbor, St. Joseph River	400
Brighton, Maltby Lake	†3,000
Butternut, Crystal Lake	800
Clyde, Irving Lake	†4,000
Round Lake	†3,000
Summers Lake	†4,000
Town Line Lake	†3,000
Wheeler Lake	†3,000
Crystal Falls, Armstrong Lake	280
Lower Holmes Lake	280
Paint River	280
Swan Lake	280
Edwardsburg, Bull Lake	400
Elba, Hasler Lake	400
Engadine, Millecougin Lake	300
Escanaba, Lake Florence	600
Hamburg, Pleasant Lake	1,000
Hancock, Lake Gerald	280
Howell, Greenaway Lake	†3,000
Ishpeming, Grass Lake	600
Island Lake, Island Lake	†4,000
Jackson, Big Portage Lake	†4,000
Browns Lake	†3,000
Wolf Lake	†4,000
Lake George, Lake George	1,200
Lakeland, Huron River	800
Leonard, Echo Lake	1,000
Little Lake, Horseshoe Lake	600
Princess Lake	600
Long Lake, Au Sable Lakes	800
Marenisco, Lake Gogebic	280
Marquette, Au Train Lake	300
Gorge Lake	250
Pickerel Lake	300
Section Ten Pond	300
Werner Pond	250
Middleville, Thornapple River	400
Mitchell Spur, Spring Lake	280
Newaygo, Emerald Lake	750
Sylvan Lake	750
Northville, D. I. G. Lake	200
Orchard Lake	1,000
Pine Lake	1,000
Round Lake	1,000
Osseo, Bird Lake	400
Pori, Bob Lake	280
Republic, Michigamme River	600
Rockland, Michigan Pond	280
Rose Center, Long Lake	†4,000
Mallett Lake	†4,000
North Buckhorn Lake	†4,000
South Lyon, Sandy Bottom Lake	†3,000
South Range, Lake Eva	420
Stanton, Clifford Lake	†1,500
Traverse City, Long Lake	400
Twin Lake, Stevens Lake	1,200
Wixon, Proud Lake	†3,000
Minnesota:	
Detroit, Big Detroit Lake	200
Big Floyd Lake	200
Minnesota—Continued.	
Detroit, Big Pelican Lake	200
Buffalo Lake	200
Cotton Lake	200
Cushman Lake	200
Eunice Lake	200
Fox Lake	200
Little Floyd Lake	200
Little Pelican Lake	200
Long Lake	200
Maud Lake	200
Meadow Lake	200
Melesia Lake	200
Munson Lake	200
Muskrat Lake	200
Pearl Lake	200
Rock Lake	200
Sally Lake	200
Twin Lakes	200
Elysian, Lake Francis	300
Litchfield, Clear Lake	200
Dunn Lake	200
Greenleaf Lake	200
Lake Manuella	200
Lake Minniebelle	400
Lake Richardson	200
Lake Ripley	200
Lake Stella	200
Lake Willie	200
Star Lake	200
Washington Lake	200
Red Wing, Mississippi River	a2,075
Waverly, Waverly Lake	300
Missouri: Rolla, Big Piney River	100
New Hampshire:	
Antrim, Gregg Lake	†3,000
	600
Ashland, Asquam Lake	600
Concord, Contoocook River	†3,000
Dover, Bellemy River	250
Durham, Wheelwright Pond	250
Enfield, Mascoma Lake	500
Gale, Kalelemook Lake	400
Milford, Baboosic Lake	†3,000
Nashua, Baboosic Lake	600
South Hampton, Pow Wow River	†2,000
Tuxbury Pond	†2,000
New York:	
Altamont, Summit Club Lake	1,000
Amenia, Mill Pond	400
Amsterdam, Lake Galaway	400
Schoharie River	600
Cambridge, Lake Lauderdale	300
Cobleskill, Bears Gulf Lake	300
Hudson Lake	200
Schuyler Lake	300
Summit Lake	300
Cohoes, Mohawk River	400
Davenport, Sexsmith Lake	125
Fishkill, Bennywater Pond	75
Glens Falls, Glen Lake	300
Gloversville, Canada Lake	400
Highland Falls, Po Po Lo Lake	300
Roe Lake	300
Katonah, Pea Pond	300
Kerhonkson, Lake Awosting	400
Kingston, Wallkill Creek	300
Kyserike, Rondout Creek	300
Lake Clear Junction, Osgood Lake	50
Lake Katrine, Esopus Creek	300
Lockport, Tonawanda Creek	600
Millbrook, Thorne's pond	250
Newark, Canarquea River	600
Coffey Lake	600
Niagara Falls, Niagara River	400
Norwich, Chenango Lake	400
Chenango River	500
Mead Pond	400
Plymouth Lake	400
Ruggs Pond	500
Steers Pond	500

a Rescued from overflowed lands and restored to original owners.

Distribution of fish and eggs, fiscal year 1918—Continued.

SMALLMOUTH BLACK BASS—Continued.

Disposition.	Number.
New York—Continued.	
Ossining, Dream Lake	300
Pleasant Lake, Pleasant Lake	50
Port Jervis, Delaware River	400
Riverside, Brant Lake	400
Schroon Lake	600
St. Johnsville, West Canada Lake	400
Saratoga Springs, Saratoga Lake	1,800
Schnectady, Ballson Lake	900
Mohawk River	900
Sharon Station, Round Pond	60
White Plains, Rye Lake	600
North Carolina:	
Elizabethtown, White Lake	190
Fayetteville, Lakewood Lake	150
Texas Lake	150
St. Pauls, Great Marsh Pond	190
Ohio:	
Berea, Duck Pond	300
Canal Fulton, Ohio Canal	450
Cardington, Olentangy Creek	1,500
Chillicothe, Lake Rena	450
Lake Rowena	1,000
Columbus, Alum Creek	1,000
Crestline, Sandusky River	1,500
Loveland, Little Miami River	2,000
Minerva, Big Sandy Creek	450
Newark, Licking River	1,500
Raccoon Creek	1,000
Ravenna, Lake Hodgson	450
Sandy Lake	300
Sycamore, Sycamore Creek	1,500
Urbana, Nettle Creek	1,500
Utica, Sycamore Creek	500
Woodsfield, Alum Creek	450
Clear Fork Creek	450
Crane Nest Creek	450
Jennings-Davis Pond	300
Licking River	300
Muskingum River and branches	2,700
Nettle Creek	300
Rocky Fork Creek	300
Sunfish Creek	450
Youngstown, Coalburg Pond	300
Pennsylvania:	
Doylestown, Mill Creek	400
Neshaminy Creek	400
Pine Run	800
Tohickon Creek	400
Indiana, Crooked Creek	1,200
Quakertown, Gimbel Creek	1,200
Sterner Pond	1,200
Swamp Creek	1,200
Reading, Tulpehocken Creek	800
Royersford, Swamp Creek	400
Saegertown, French Creek	2,400
Sharpsville, Pymatuning Creek	450
Shenango River	450
Rhode Island:	
Providence, Gorton Pond	33
Herring Pond	25
Moscow Pond	150
Moswansicut Pond	25
Pascoag Pond	25
Quidnick Pond	33
Sand Pond	34
Tucker Pond	150
Wallum Pond	25
Watchaug Pond	40
Yawcoog Pond	150
Wakefield, White Pond	200
Tennessee:	
Bristol, Holston River	175
Etowah, Camponey Lake	†1,000 250
Rock Island, Caney Fork River	3,500
Vermont:	
Brattleboro, Hunts Meadow Lake	40
Sunset Lake	40
Vermont—Continued.	
Burlington, Lake Champlain	100
Canaan, Wallis Pond	53
Castleton, Lake Bomoseen	80
Fairlee, Lake Morey	75
Ferrisburg, Little Otter Creek	100
Hardwick, Valley Lake	125
Montpelier, Curtis Pond	50
Morrisville, Lake Lamoille	225
North Ferrisburg, Cedar Lake	100
Richmond, Winooski River	50
Rutland, Burr Pond	200
East Pittsford Pond	150
Springfield, Black River	75
Walden, West Hill Pond	50
Wilmington, Lake Raponda	50
Windsor, Kanadie Mill Pond	75
Runnemede Pond	75
Wolcott, Wolcott Pond	100
Virginia:	
Ashburn, Goose Creek	800
Ashland, Little Clear Lake	300
Fredericksburg, Ni River	†3,000
Po River	†3,000
Kinsale, Cat Point Creek	195
West Point, Marston's pond	†4,000
West Virginia:	
Berkeley Springs, Sleepy Creek	1,200
Bluestone, Bluestone River	420
Brown, Ten Mile Run	200
Harpers Ferry, Potomac River	9,800
Marlinton, Knapp Creek	†5,000
New Martinsville, Fishing Creek	1,200
Paw Paw, Great Cacapon River	1,200
Petersburg, Potomac River, South Branch	1,200
Romney, Potomac River, South Branch	†10,000
Springfield, Patterson Creek	†4,000
Potomac River, South Branch	†5,000
Wisconsin:	
Athelstane, Elbow Lake	600
Bay City, Mississippi River	a 270
Boyd, Cornell Lake	200
Wolf River, North Fork	200
Yellow River	200
Donaldson, Bear Lake	300
Little Bass Lake	300
Ellis Junction, Eagle Lake	300
Frying Pan Lake	300
High Falls Lake	300
Lake Noquebay	300
Left Foot Lake	300
Perch Lake	300
Peshtigo River	300
Woods Lake	300
Hayward, Big Spider Lake	400
Grindstone Lake	400
Little Spider Lake	200
Lost Land Lake	200
Smith Lake	200
Spring Lake	200
Iron River, Island Lake	1,400
Pike Lake (A)	400
Pike Lake (B)	1,000
Sandbar Lake	400
Park Falls, Round Lake	280
Schnurs Lake	280
Phillips, Bass Lake	280
Ringle, Spring Lake	200
Sheboygan Falls, Long Lake	100
Stone Lake, Ham Lake	400
Waupaca, Big Lake	100
Hat Factory Pond	100
McCrossen Lake	100
Total b	†172,500 155,674

a Rescued from overflowed lands and restored to original waters.
b Exclusive of 1,500 fry and 9,515 fingerlings lost in transit.

Distribution of fish and eggs, fiscal year 1918—Continued.

ROCK BASS.

Disposition.	Number.
Alabama:	
Bayou Labatre, Little River	500
Birmingham, Ketona Pond	250
Jasper, Sims-Long Pond	125
Montgomery, Mill Creek	1,800
Pine Hill, Sheffield's pond	250
Spring Branch	500
Russellville, Lake Galey	375
Lake Rockwood	250
Arkansas:	
Elba, Mill Hollow Creek	273
Gilbert, Calf Creek	273
Dry Creek	273
Mill Creek	273
Mammoth Spring, Warm Fork Creek	916
Poe, Little Red River	274
Shirley, Little Red River, Archys Fork	274
Texarkana, Country Club Lake	800
Connecticut: Bridgeport, Busser's pond	200
Delaware: Wilmington, Barnett Lake	300
Georgia:	
Bellville, Briarwood Pond	400
Cartersville, Clear Creek	800
Cave Springs, Tallalah Lake	400
Winder, Eastview Lake	400
Illinois:	
Aurora, Deitrich's pond	114
New Boston, Mississippi River	a 167
Villa Ridge, Aldrich's pond	300
Indiana:	
Huntington, Clear Creek	300
Little River	300
Rock Creek	300
Salamonie River	300
Wabash River	300
Ingle Station, Volkmann's pond	200
Winemac, Huddleston's pond	100
Iowa:	
Allerton, Rock Island Reservoir	300
Bellevue, Mississippi River	2,500
Kansas:	
Fort Scott, Sheeler Lake	800
Parsons, Labette Creek	800
Kentucky:	
Cadiz, Donaldson Creek	1,500
Campbellsburg, Spring Lake	500
Central City, Roll's pond	500
Cynthiana, Duck Pond	200
Georgetown, Elkhorn Creek	150
Hopkinsville, Lake Tandy	1,200
Little River	1,200
Little River, East Fork	1,200
Pond River, West Fork	1,200
Lexington, Spring Bank Pond	100
Louisville, Lake Idlewylde	400
Lake Lansdowne	1,000
Tip Top, Forest Home Pond	700
Walton, Boone Lake	100
Louisiana:	
Cade Station, Pharr's pond	200
Natchitoches, Cane River Lake	750
Maryland: Sparks, Pearce's pond	50
Michigan:	
Iron River, Fifteen Lake	300
Twin Lake, Middle Lake	200
Twin Lake	200
Minnesota: Homer, Mississippi River	a 218
Mississippi:	
Aberdeen, Baker Lake	500
Black Pond	84
Bogan Pond	100
Carter Pond	200
Deer Lake	625
Glenn Lake	200
Greer's pond	200
Jones Lake	200
Kinnie Lake	400
Mississippi—Continued.	
Aberdeen, Rinney Creek	200
Smith Lake	100
Baldwin, McDonald Lake	250
Bovina, Clear Creek	500
Corinth, Skillman's pond	500
Crystal Springs, Batton's pond	150
Friar Point, Moon Lake	980
Gulfport, Bayou Barnard	2,900
Learned, Lowry's pond	225
Meridian, Oak Pond	500
Mize, Robertson's pond	150
Natchez, College House Pond	150
Pontotoc, Highland Pond	250
Johnston's pond	625
Taylor, Tatum's pond	250
Toomsuba, King's pond	250
West Point, La Rue's pond	250
Nangle Pond	250
Prairie Lake	100
Woodville, Poland's pond	100
Missouri:	
Aurora, Flat Creek	800
Fanning, Elk Springs Lake	1,000
Gilliam, Waterworks Pond	150
Lebanon, Kneedler's pond	400
McNeill's pond	600
Passaic, Limestone Lake	200
Phillipsburg, Shaffer's pond	200
Rolla, Barnitz Lake	200
Little Piney River, Lower	400
New Mexico:	
Estancia, Clubb's pond	200
Roswell, Chain Lake	200
Guajalote Lake	150
Summer Lake	100
Sunset Lake	200
Sutherland Lake	200
North Carolina:	
Asheville, Barber's pond	200
Beechwood Lake	800
White Flint Pond	1,000
Concord, Gibson's pond	800
Pemberton Pond	800
Petrea's pond	1,000
Elkin, Cobb Creek	1,000
Flat Rock, Draper Pond	1,000
Lumberton, Leonard Mill Pond	1,000
Matthews, Martin's pond	800
Monroe, Maple Spring Pond	1,000
Newton, Sigman's pond	1,000
Pee Dee, Blewett Falls Pond	2,500
Raleigh, Neuseoco Club Lake	1,000
Wake Forest, Powell's pond	200
North Dakota: Lisbon, Ash Grove Pond	100
Ohio:	
Amsden, Pankhurst's pond	100
Columbus, Scioto River	100
Newton Falls, Milton Lake	200
Outville, Lickling River, South Fork	100
Pemberville, Rice's pond	100
Oklahoma:	
Armstrong, State Ponds	1,550
Goteba, Branson's pond	300
Mangum, Thomason's pond	37
Pauls Valley, Perkins's pond	300
Vici, South Persimmon Pond	38
Pennsylvania:	
Brookville, Arthurs's pond	50
Brownsville, Cleaver's pond	50
Hollidaysburg, Leighty's pond	100
Washington, Borcher's pond	100
South Carolina: Clover, Adams's pond	1,000
Tennessee:	
Athens, Big Mouse Creek	1,000
Bolivar, Ferguson's pond	150
Chattanooga, Pan Gap Lake	300

a Rescued from overflowed lands and restored to original waters.

Distribution of fish and eggs, fiscal year 1918—Continued.

ROCK BASS—Continued.

Disposition.	Number.	Disposition.	Number.
Tennessee—Continued.		Virginia—Continued.	
Cleveland, Maple Lake	1,000	Mount Holly, Weston Place Pond	50
Cumberland Gap, Indian Creek	1,000	Peakes, Reformatory Mill Pond	300
Doyle, Terry's pond	100	Richmond, Vaiden Club Pond	800
Farmer, Barney Creek	1,000	Williams Pond	400
Franklin, Big Harpeth River	150	Roanoke, Roanoke River	400
McDaniel Pond	150	Salem, Roanoke River	400
West Harpeth River	300	Singer, Roanoke River	400
Harriman, Gallaher's pond	1,000	Scottsville, Chester Pond	200
Jefferson City, Dumpan Creek	1,500	Starkey, Back Creek	400
Johnson City, Limestone Creek	1,000	Suffolk, Nansemond River	300
Lancing, Rock Creek	1,500	Tunstall, Garlick Pond	500
McMinnville, Charles Creek Pond	400	West Virginia:	
Watertown, Fall Creek Pond	1,000	Cloverlick, Thorny Creek	325
Virginia:		Elkins, Tygarts Valley River	400
Ashland, Decarseau Pond	200	Philippi, Whitman Pond	400
Atlee, Wheat's pond	300	Wisconsin: Stone Lake, Little Sissabagama Lake	136
Bedford, Thomas's pond	200		
Haysi, Russell Fork	2,000	Total [a]	83,055
Hot Springs, Jackson River	325		

WARMOUTH BASS.

Alabama: Florence, Holiway's pond	450	Mississippi: Aberdeen, Jones Creek	800
Iowa:			
Bellevue, Mississippi River	[b] 7,710	Total	9,220
North McGregor, Mississippi River	[b] 260		

SUNFISH (BREAM).

Alabama:		Alabama—Continued.	
Alberta, Henley's pond	400	Greenville, Beeland Mill Pond	400
Ashby, Blue Spring Pond	800	Boutwell's pond	400
Atmore, Boone's pond	400	Four Mile Pond	1,200
Hurricane Pond	800	McKenzie's pond	600
Bankston, Clear Creek Pond	800	Mill Pond	1,000
Bayou Labatre, Little River	375	Pigeon Creek	1,200
Bessemer, Shoal Creek	800	Pine Barron Creek	400
West Lake	800	Rouse Mill Pond	600
Birmingham, Black Creek	800	Thagard Mill Pond	1,400
Blount Springs, Blount Springs Creek	400	Guin, Markham's pond	400
Boaz, Brown's pond	400	Hackleburg, Green's pond	200
Brantley, Johnson's pond	400	Haleyville, Bear Creek	400
Powell's pond	200	Hamburg, Tarry Pond	200
Bridgeport, Valley View Pond	400	Vaughan Lake	1,000
Calera, Newala Pond	200	Hartford, Leddon's pond	300
Camden, Bonner's ponds	1,000	Headland, Blue Pond	400
Castleberry, L. Pond	250	Hodge, Hodge Reservoir	600
Clanton, Headley's pond	800	Inverness, Cogdell's pond	400
Cuba, Culpepper's pond (A)	400	Jasper, Black Warrior River	1,600
Culpepper's pond (B)	400	Blackwater Creek	1,200
Delaine's pond	400	Long's pond (A)	200
Cullman, Baier's pond	400	Long's pond (B)	1,000
Loyd's pond	400	Sunlight Pond	800
Cusseta, Davis Creek	400	Keener, Brandon's pond	200
Dozier, Frazier's pond	400	La Pine, Perdue's pond	300
Thomason's pond	400	Letohatchie, McPherson's pond	400
Evergreen, Braxton's pond	400	Pine Lake	400
Brooks's pond	400	Whitley's pond	200
Coleman's pond	600	Lineville, Carroll's pond	400
Lundy's pond	400	Livingston, McCain's pond	600
McGraw's pond	600	Loachapoke, Robertson's pond	400
Moorer's pond	400	Lowndesboro, McCurdy's pond	800
Salter's pond	600	Reese Pond	800
Fayette, Beard's pond	200	Luverne, Bozeman's pond	400
Jones Mill Creek	800	Cody's pond	200
Musgrove Mill Pond	600	Horn's pond	300
Fort Deposit, Davis's pond	400	Hudgens's pond	400
Gadsden, Big Canoe Creek	200	Kendrick's ponds	500
Gordo, Mullican's pond	600	Welch's pond	400
Goshen, Hill's pond	200	Wolfe's pond	850
Greensboro, Sherwood Pond	200	McGehees, Crenshaw's pond	400
Stickney's pond	200	McWilliams, Lamkin's pond	200
		Madison, Fairdale Lake	800

[a] Exclusive of 1,800 lost in transit.
[b] Rescued from overflowed lands and restored to original waters.

Distribution of fish and eggs, fiscal year 1918—Continued.

SUNFISH—Continued.

Disposition.	Number.
Alabama—Continued.	
Madison, Fletcher's pond	800
Marion, Grantham's pond	200
Midland, Echo Pond	150
Sewell Lake	150
Midway, Seay's pond	200
Monroe, Double Branches	600
Montgomery, Big Whitewater Lake	400
Club Lake	1,200
Little Whitewater Lake	600
Mill Creek	600
Murphy Siding, Horseshoe Lake	400
Newbern, Allen's pond	400
Oak Grove, Davis Mill Pond	800
Oneonta, Burnett's pond	200
Kent's pond	200
Opelika, Cress View Lake	600
Lake Condy	400
Opp, Bermuda Pond	600
Edgar Spring Pond	650
Frazier's pond	400
Gardner's pond	600
Owassa, Ward Pond	400
Phil Campbell, Dismal Pond	800
Peters's pond	200
Pike Road, Barnett's pond	800
Pine Apple, Melton-Hale Pond	200
Pine Hill, Sheffield's pond	800
Pyriton, Shadix's pond	200
Ramer, Brick Mill Pond	200
Riderwood, Lake Cavezel	600
Roanoke, Taylor's pond	400
Ussery's pond	400
Russellville, Hester's pond	400
Scottsboro, Blacks Creek	800
Seale, Anderson's lake	400
Sellers, Beck's pond	400
Selma, Elkdale Lake	2,000
Harrison's pond	400
Shellhorn, Belser-Cochran Pond	400
Snowhill, Powell's pond	200
Sprague, Esdraelon's pond	200
Walter's pond	400
Sulligent, Brown's pond	400
Buckelew's pond	400
Sweetwater, Hatch's pond	200
Sweetwater Pond	200
Sylacauga, Bryant's pond	200
Talladega, Chambers Lake	600
Troy, Anderson's pond	200
Blair Pond	400
Bower's pond	200
Henderson's pond	900
Jones's pond (A)	200
Jones's pond (B)	200
Lee's pond	400
Leslie's pond	400
Northcut Lake	400
Sanders's pond	400
Troy Pond	600
Winslett Pond	200
Tyson, Dead Lake	400
Garrett Pond	400
Jones Lake	1,200
Smith Lake	400
Tyson Lake	400
Union Springs, Fenn's pond	200
Wetumpka, Ensign Pond	400
Silver Lake	400
Winfield, Musgrove Lake	400
Whitney, Chrystal Springs Pond	400
York, Altman's pond	1,000
Youngblood, Howard's pond	200
Arizona:	
Benson, Kiper's pond	100
Willow Ponds	200
Holbrook, Cast Iron Creek	450
Nogales, Guevave Pond	200
Pinto, Henning Lake	150

Disposition.	Number.
Arkansas:	
Biscoe, Gold Medal Lake	1,200
Black Rock, Black River	a 2,320
Browns Lake, Black River	a 495
Charleston, McDonald's pond	300
Forest City, Trapp's pond	1,500
Manson, Black River	a 5,075
Okolona, Farm Pond	300
Ozan, Smisson Farm Pond	300
Ozark, Dean's pond	300
Colorado:	
Lamar, Two Buttes Lake	450
Loveland, Bestle Lake	400
Lake Loveland	250
Miramonte, Carter Lake	250
Wray, Olive Lake	250
Robbs Lake	250
Zepp Lake	250
Connecticut:	
Deep River, Crystal Pond	150
East Haddam, Joshua Pond	2,400
Rockville, Poehnert Pond	150
Florida:	
Bascom, Bonnett Pond	600
Cottondale, Cole Pond	900
Palmore, Palmore Pond	300
Quincy, Bruce's pond	600
Windermere, Lake Besssie	900
Georgia:	
Adrian, Flanders's pond	200
Albany, Tift's pond	200
Amboy, Haman's pond	400
Americus, Council Mill Pond	600
Mill Pond	600
Ranew's pond	300
Ashburn, Raney's pond	200
Shivers's pond	200
Avera, Hudson Pond	400
Athens, Jones's pond	200
Waterworks Pond	400
Atlanta, Dodson's pond	150
Johns Pond	200
Meadow Lake	400
Augusta, Millner Pond	1,000
Osceola Lake	200
Booneville, Wilson's pond	200
Boston, Miller's pond	400
Bowman, Hewell's pond	100
Buchanan, Bush's pond	100
Butler, Bartlett Mill Pond	400
Byron, Upper Pond	600
Carrollton, Stalling's pond	200
Cave Springs, Little Cedar Creek	400
Chalker, Hattaway's pond	200
Colbert, Carithers's pond	400
College Park, Davis's pond	100
Conyers, Gailey's pond	200
Granade's pond	200
Yellow River	600
Crest, Butts's pond	200
Mountain Pond	200
Culverton, Waller's pond (A)	200
Waller's pond (B)	200
Cusseta, Harp's pond	200
Cuthbert, Martin's pond	600
Peak's pond	200
Dacula, Frachiseur's pond	200
Damascus, Haddock's pond	400
Dawson, Brown Mill Pond	600
Douglasville, Elm View Pond	200
Dover, Oliver's pond	1,000
Duluth, Martin's pond	200
Shirley's pond	150
Edison, Rambo's pond	200
Ellaville, Hanner's pond	200
Folkston, Bakers Branch	200
Dixie Lake	400
Forestville, Elner Lake	200
Fort Gaines, Foster's pond	200

a Rescued from overflowed lands and restored to original waters.

Distribution of fish and eggs, fiscal year 1918—Continued.

SUNFISH—Continued.

Disposition.	Number.
Georgia—Continued.	
Gainesville, Waters's pond	150
Glenwood, Morrison's pond	400
Good Hope, East Lake	200
East Pond	600
Horn Lake	600
North Pond	400
West Lake	200
Gough, Shaver Creek Pond	400
Grantville, Lambert Pond	200
Greensboro, Sanders Mill Pond	800
Helena, Martin's pond	200
Higgston, Morris's pond	600
Kingston, Harris's pond	200
Kite, Townsend's pond	400
Lizella, McElmurry Pond	200
Lumpkin, Mercer Pond	400
Pitts Pond	300
McIntyre, Jackson's pond	200
Mableton, Glore's pond	200
Mansfield, Adams Pond	200
Marietta, Old Waterworks Lake	600
Matthews, Goodin Mill Pond	400
Smith's pond	400
Monroe, Club Pond	600
Poplar Pond	200
Montezuma, Minor Pond	200
Shiloh Pond	200
Moultrie, Clear Branch	600
Willow Spring Pond	400
Nacoochee, Nacoochee River	300
Omega, Powell Pond	100
Pelham, Pelham Pond	200
Perkins, Jackson Pond	1,000
Putnam, Johnson Lake	600
Quitman, Black Gum Pond	1,000
Raymond, Raymond Lake	800
Rebecca, Nosworthy's pond	600
Red Oak, Woodrow Pond	150
Renfroes, Smith's pond	200
Richland, Mill Pond	400
Rockmart, County Line Pond	100
Rome, Floyd's pond	200
Shellman, Crittenden's pond	200
East Lake	400
Social Circle, Sluder Pond	400
Smith's pond	400
Springvale, Hill's pond	200
Statesboro, Williams's pond	600
Silesboro, Cannon's pond	300
Swainsboro, McKinney Pond	400
Ohoopee River	400
Youmans Pond	600
Sylvester, Bowen's pond	400
Bozeman's pond	200
Tallapoosa, Pope's pond	100
Thomasville, Rehberg's pond	50
Roddenby's pond	50
Smith's pond	50
Smith-Moreland Pond	50
Wheeler's pond	100
Thomson, Big Branch Pond	600
Gibson's pond (A)	400
Gibson's pond (B)	400
Upatoie, Sizemore's pond	400
Vanna, Tucker's pond	200
Vidalia, Rountree's pond	200
Wadley, Caldwell's pond	200
Warrenton, Cason's pond	400
Whitesburg, Chatham's pond	150
Winder, Junior Pond	400
Sunnybrook Pond	200
Woodbury, Sims Spring Pond	180
Illinois:	
Apple River, Apple River, North Branch	400
Belleville, Dewey Lake	1,200
Blanding, Mississippi River	a21,500
Carrollton, Lake of the Woods	300
Freeport, Waters of Illinois	7,150
Galena Junction, Mississippi River	a55,500
Hanover, Mississippi River	a20,900
Joliet, Hickory Creek	300
Lena, Mammooser Lake	800
Meredosia, Illinois River	a79,550
Naperville, South Quarry Pond	200
New Boston, Mississippi River	a60,044
Nora, Apple River, East Branch	400
Pana, Sidner's pond	1,200
Philadelphia, Homestead Pond	300
Scales Mound, Mill Creek	400
Tunnel Hill, Beauman's pond	150
Warren, Apple River, East Branch	220
Indiana:	
Angola, Crooked Lake	40
Cedar Grove, Wedding's pond	10
Cloverdale, McKamey's pond	100
Edinburg, Sugar Creek	400
Elkhart, St. Joe River	40
Greensburg, Grays Lake	100
McCoy Lake	1,000
Marion, Gards Pond	400
Plymouth, Dixon Lake	800
Pretty Lake	800
Ramsey, Smith's pond	200
Sharpsville, Becker's pond	400
Spencer, Ludlow Lake	400
Whiteland, Waterloo Pond	100
Wilkinson, Perry Lake	400
Williamsburg, Elm Lake	400
Winchester, Funk's lake	400
Iowa:	
Albia, Stason's pond	100
Wild Goose Ridge Pond	100
Ames, Springdale Pond	250
Bellevue, Mississippi River	a91,460
Clayton, Mississippi River	a200
Cresco, Iowa River	150
Turkey River	150
Fairport, Mississippi River	a34,602
Green Island, Mississippi River	a12,500
Guttenburg, Mississippi River	a300
Hesper, Oakland Cottage Pond	100
Iowa Falls, Iowa River	1,500
Manchester, Maquoketa River	2,000
North McGregor, Mississippi River	a19,495
Perry, Raccoon River	300
Pleasant Creek, Mississippi River	a10,000
Sny Magill, Mississippi River	a4,500
Yellow River, Mississippi River	a1,000
Kansas:	
Chanute, Hurt's pond	200
Fort Scott, Sheeler Lake	400
Parsons, Labette Creek	300
Winona, Felts-Jackson Pond	100
Kentucky:	
Boston Station, Burlew's pond	100
Corbin, King's pond	200
Covington, Willow Springs Pond	200
Crab Orchard, Livingston's pond	200
Devong, Spring Lake	500
Edgeton, Anderson's pond	200
Given's pond	400
McKenzie Lake	500
Sallee Pond	400
Steep Hill Pond	600
Tandy's pond	200
Eubank, Maple Pond	200
Florence, Hanaker's pond	200
Glasgow, Whitehead's pond	100
Horse Cave, Hall's pond	400
Hardy's pond	400
Louisville, Beargrass Creek	3,300
Harrods Creek	1,300
Lake Lansdowne	1,000
Madisonville, Pritchett's pond	100
Salome Pond	100
Morehead, Triplett Creek	400
Morning View, Carlisle's pond	200

a Rescued from overflowed lands and restored to original waters.

Distribution of fish and eggs, fiscal year 1918—Continued.

SUNFISH—Continued.

Disposition.	Number.
Kentucky—Continued.	
Murray, Parker's pond	100
Nebo, Herron's ponds	200
Nicholasville, Vince's pond	200
Pewee Valley, Confederate Home Pond	200
Pikesville, Big Sandy River	200
Riney, Clear Pond	600
Davis Pond	600
Shelbyville, Clear Creek	400
Guthrie's pond	100
Smiths Grove, Moon's pond	200
Springfield, Spaulding's pond	600
Whitesburg, Clay's pond	100
Louisiana:	
Alexandria, Carter's pond	900
Baton Rouge, Amite River	a 4,000
Mississippi River	a106,950
University Lake	a 2,650
Cades, Fremin's pond	750
Choudrant, Crescent Lake	1,200
Church Point, Daigle's pond	600
Dubach, Lake Dubach	1,200
Ethel, Schutzmann's pond	300
Hackley, Thomas's pond	600
Haynesville, Braselton's pond	500
Homer, Fortson's pond	500
Johnson's pond	500
McElwee's pond	500
Natchitoches, Cane River Lake	4,300
Shreveport, Clear Lake	1,200
Whitman, Woodville Pond	375
Maryland:	
Branchville, McKinley's pond	150
Hagerstown, Antietam Creek	450
Conoccocheague Creek	300
Millers, Hoover's pond	150
Roslyn, Klohr's pond	150
Seneca, Potomac River	a 150
Woodensburg, Wooden's pond	150
Massachusetts:	
Clinton, Wauschacum Lake	300
Falmouth, Bournes Pond	150
Plymouth, Moreys Pond	150
Michigan:	
Alpena, Hubbard Lake	60
Long Lake	40
Belleville, Susterka Lake	20
Cassopolis, Stone Lake	20
Lake, Crooked Lake	20
Marquette, Wittler's lake	500
Rose Center, South Buckhorn Lake	20
Warren, Harwood's pond	20
White Cloud, Big Robinson Lake	20
Long Lake	20
Lost Lake	20
Minnesota:	
Clearbrook, Olson Lake	400
Homer, Mississippi River	a 433,002
Pelican Rapids, Lake Lizzie	a1,250
Red Wing, Mississippi River	a9,015
Windom, Fish Lake	400
Worthington, Lake Okabena	600
Mississippi:	
Aberdeen, Baker Lake	300
Amory, Coudrey's pond	250
Belmont, Spencer's pond	200
Bentonia, Plainview Plantation Pond	300
Booneville, Mason's pond	800
Mill Branch	400
Canton, Bourgeois's pond	300
Caldwell Lake	300
Jones Pond	300
Ray Pond	600
Troutman Pond	500
Twin Sisters Lake	1,500
Capleville, Evans's pond	1,200
Como, Wallace's pond	600

Disposition.	Number.
Mississippi—Continued.	
Corinth, McClintock's pond	400
Sandy Lake	400
Decatur, Hollingsworth's pond	300
Ecru, Spencer's pond	250
Enterprise, Phillips's pond	200
Fayette, Carradine Pond	100
Dixie Hope Lake	200
Flora, Collum's pond	100
Goodloe's pond	100
Jones Pond	100
Simpson's pond	100
Forest, Gay Lark Pond	250
Young's pond	250
Friar Point, Mississippi River	a 43,900
Moon Lake	200
Fulcher, Snow's pond	600
Gattman, Arnold's pond	200
Harriston, Freeman's pond	100
Hickory, Deavitt's pond	900
McCary's pond	250
Hickory Flat, Brownlee's pond	800
Holcomb, Staten's pond	300
Jackson, Bailey Pond	600
Country Club Pond	900
Davidson Lake	600
Pearl River	600
Spring Lake	1,500
Kilmichael, Thompson Pond	300
Lawrence, Nelson's pond	250
Stephen's pond	250
Learned, McNair's pond	100
Lorman, China Grove Lake	250
McAdams, Gilbert's pond	800
McAdams Lake	400
McCall Creek, Coward's pond	250
McCool, Rook's pond	400
Veal Lake	400
Macon, Cedar Grove Lake	300
Cline Pond	300
Eiland Pond	900
Goodwin Lake	300
Helm's pond	300
Holberg Pond	300
Howard Lake	900
Paulette Lake	900
Magnolia, Minnehaha Creek	900
Mathiston, Blythes Pond	300
Ray's pond	600
Meridian, Bailey's pond	600
Ethridge's pond	900
Fairchild Lake	800
Lakeview Lake	500
Lyle's pond	600
Queen City Lake	800
Rushe Mill Pond	800
South Lake	600
Weems's pond	800
Natchez, Elgin Pond	100
Fowler's pond	250
New Albany, Phyfer's pond	200
Newton, Chapman's pond	250
Kennedy's pond	500
Ocean Springs, Simmons's pond	150
Pattison, Gilston's pond	250
Penn, Blue Lake	300
Pheba, Bennett's pond	300
Reid's pond	300
Philadelphia, Boguechito Lake	250
Loften's pond	250
Lundy's pond	750
Mitchell's pond	500
Williams's pond	500
Wilson's pond	250
Picayune, Tate's pond	300
Pickens, Ellendale Pond	600
Pontotoc, Watson Pond	256
Reform, Kellum's pond	250
Ripley, Pearce's pond	500

a Rescued from overflowed lands and restored to original waters.

Distribution of fish and eggs, fiscal year 1918—Continued.

SUNFISH—Continued.

Disposition.	Number.
Mississippi—Continued.	
Selma, Miller's pond	250
Sessums, Castle's pond (A)	300
Castle's pond (B)	300
Castle's pond (C)	300
Shannon, Crubaugh's pond	300
Shuqualak, Bell's pond	400
Fleming's pond	400
McLeod's pond	400
Mack's pond	400
Silver Creek, Allen Lake	600
Soso, Powell's pond	600
Starkville, Bell's pond (A)	400
Bell's pond (B)	400
Bell's pond (C)	400
Bell's pond (D)	400
Kennard's pond (A)	600
Kennard's pond (B)	300
Lewis's pond	300
Meadowview Pond	600
Norris's pond	300
Old Scout Club Lake	600
Rice's pond	300
Smith's pond (A)	300
Smith's pond (B)	300
Smith's pond (C)	300
Wellborn Pond	300
Steens, Nickles's pond	300
Sturgis, Shady Grove Pond	800
Summerland, Grissom's pond	600
Tupelo, Clover Hill Pond	200
Fulton Pond	400
Lake View	200
Locust Pond	200
Locust Hill Pond	200
Union, Rock Pond	250
Smith's pond	250
Utica, Broome's pond (A)	200
Broome's pond (B)	300
Vaiden, Samek's pond	600
Vardaman, Cable's pond	400
Vicksburg, Bell View Pond	100
Cemetery Lake	200
Gesell's pond	100
Hibler Lake	100
Waveland, Anderson's pond	150
Woodville, Roland's pond	375
Missouri:	
Hallsville, Mitchell's pond	200
Independence, Swinney's pond	400
Walnut Grove Pond	200
Joplin, Sloan's pond	98
Kansas City, Lake of the Woods	150
Silver Lake	500
Lamar, Jackson's pond	3,000
Lebanon, Kneedler's pond	600
Neosho, Hickory Creek	26,000
Indian Creek	3,000
Nevada, Katy Allen Lake	600
Phillipsburg, Warner's pond	200
Pierce City, Shipman's pond	300
Saginaw, Morsman's pond	500
Seligman, Roller's pond	500
Sweet Springs, Hulse's pond	400
Thayer, Olbricht's pond	500
West Plains, Summers's pond	1,000
Twin Ponds	500
Montana: Miles City, Yellowstone River	100
New Hampshire: Concord, Contoocook River	150
New Jersey:	
Burlington, Delaware River	300
Dunnellen, Tuttle's pond	100
Flemington, Fauss's pond	100
Hopewell, Moore's pond	100
Penns Grove, Layton Lake	200
New Mexico:	
Capitan, Dean's pond	100
Des Moines, Edmonson's pond	150

Disposition.	Number.
New Mexico—Continued.	
Elida, Locust Pond	50
Engle, Lake B. M. Hall	1,200
Estancia, Alamos Pond	150
Folsom, Howey's pond	150
Kenna, Carmichael's pond	100
Cato's pond	50
Chavers's pond	50
China Grove Pond	100
Cooper's pond	50
Cullin's pond	50
Deweese's pond	50
Fry's pond	50
Good's pond	100
Hill's pond	50
Hunter's pond	50
Littlefield's pond (A)	50
Littlefield's pond (B)	50
Rechard's pond	50
Rogers's pond	50
Savage's pond	50
Slack's pond	50
Stroud's pond	50
Roswell, Club Lake	200
Cottonwood Lake	200
Figure Eight Lake	100
Lake Dimmit	100
Lake Esther	100
Lake Julia	200
Lea Lake	100
Rainbow Lake	100
Socorro, Chambon's pond	300
New York: Hartsdale, Fishers Pond	150
North Carolina:	
Auburn, Ferrill's pond	200
Brevard, Lake Elvira	300
Catawba, Setzer's pond	100
Charlotte, Grandy's pond	800
Lakewood Pond	600
Cliffside, Fairview Pond	100
Concord, Big Bear Creek	285
Dunn, Baggett's pond	200
Elkin, Cobb Creek	800
Elk Park, Little Elk River	400
Eufola, Academy Pond	600
Greensboro, Lake Summit	200
Lake Wilpong	200
Hendersonville, Lily Pond	200
Hickory, Hop Creek Pond	500
High Point, Coe Branch Pond	200
Walnut Pond	200
Lake Junaluska, Lake Junaluska	300
Lattimore, Hughey's pond	100
Marshville, Fairview Pond	200
Marsh's pond	200
Meadowland Pond	200
Sells's pond	200
Simpson's pond	200
Monroe, Griffin's pond	200
Hargett's pond	200
Lick Branch	400
North Wilkesboro, Curtis Pond	400
Frazier-Jennings Pond	300
Hall Mills Pond	200
Henren Pond	400
Pee Dee, Blewett Falls Pond	360
Raleigh, Dowtors Lake	400
Fountain's pond	200
Milburnie Pond	400
Myatt's pond	200
Neuseoco Pond	400
Richardson Lake	200
Rutherfordton, Holland's pond	200
Selica, Spring Field Lake	200
Shoals, Scott's pond	400
Wake Forest, Bailey's pond	200
Davis's pond (A)	100
Davis's pond (B)	200
Washington, Broad Creek	400
Broad Creek Mill Pond	400

Distribution of fish and eggs, fiscal year 1918—Continued.

SUNFISH—Continued.

Disposition.	Number.
North Carolina—Continued.	
Washington, Upper Broad Creek	400
Wilkesboro, Hall's pond	200
Hall Mills Pond	200
North Dakota:	
Petrel, Lemmon Lake	60
St. John, Lakes of Rolette County	1,800
Ohio:	
Akron, East Lake	20
Long Lake	20
Nesmith Lake	20
Turkeyfoot Lake	20
West Lake	20
Barton, Shady Pond	20
Batavia, Great Meadows Pond	20
Cleveland, Owczarek's pond	10
Robinwood Pond	10
Gilbert, Lake Roeland	10
Lake View, Indian Lake	40
Millersburg, Yoder's pond	20
Newark, Licking River, North Fork	20
Newton Falls, Milton Lake	1,900
Woodsfield, Rich Fork Creek	60
Storage Pond	40
Oklahoma:	
Ardmore, Buckhorn Creek	150
Chilly Creek	150
Lone Grove Lake	450
Oil Creek	300
Armstrong, State Hatchery Ponds	1,550
Britton, Albright Pond	150
Covington, Doak Lake	150
Kingfisher, Box Springs Pond	300
Lone Grove, Anderson's pond	150
Scrivner's pond	150
Lula, Turrentine's pond	200
Lyons, Mattox's pond	400
Mangum, Reeves's pond	200
Mooreland, Meadowbrook Lake	100
Mountain View, Oak Creek	150
Muskogee, Buell's pond	400
Norman, Morrison's pond	150
Rucker Pond	150
Orlando, Beaver Valley Pond	150
Brase's pond	150
Perry, Hageman's pond	150
Marshbank's pond	150
Pagel's pond	150
Pittsburg, Lake Austin	200
Poteau, Perse Lake	200
Purcell, Camden's pond	150
Chapel Hill Pond	150
Robbins, Illinois River, Barren Fork	200
Sallisaw, Bald Knob Pond	400
Stillwater, Johnson's pond	300
Rifle Range Pond	150
Strong City, Spring Creek Pond	100
Vici, South Persimmon Pond	100
Waurika, Stewart Lake	150
Woodward, Bass Lake	100
Davis's pond	100
East Persimmon Pond	100
Geismar's pond	200
Gregg's pond	100
Lohr's pond	100
Pleasant Grove Pond	100
Salz Lake	100
Sand Creek Lake	100
West Persimmon Pond	100
Yeager Lake	100
Wynnewood, Thrasher's pond	150
Pennsylvania:	
Altoona, Juniata River	900
Bellefonte, Bald Eagle Creek	20
Downingtown, Brandywine Creek	300
East Petersburg, Gingrich Pond	150
Groff Run	150
Miller Pond	300
Snipe Creek	150

Disposition.	Number.
Pennsylvania—Continued.	
Everett, Juniata River, Raystown Branch	300
Hyndman, Wills Creek	300
Lancaster, Pequea Creek	300
Lititz, Bricker's pond	160
Doe Run Pond	160
Pennebecker Pond	320
Malvern, Peace's pond	150
Paxinos, Littel Pond	150
Pittsburgh, Gerstbrein's pond	100
Hinkel's pond	100
Jacks Run	100
Safe Harbor, Meadow Valley Run	150
Somerfield, Bridgeport Pond	40
Whiteland, Valley Creek	300
South Carolina:	
Aiken, Glover's pond	1,400
Wilson's pond	400
Alcott, Stuckey's pond	400
Blythewood, Cannon's pond	100
Branchville, Smoak's pond	200
Camden, Hermitage Pond	525
Columbia, Bay Pond	300
Cobb's pond	450
Conder's pond	450
Messers Lake	450
Snow Hill Pond	700
Whites Creek	300
Cope, Smoak Creek	500
Darlington, Edwood's pond	200
Easley, Duke's pond	600
Nally's pond	500
Edgefield, Bryan's pond	200
Johnson's pond	200
Jones's pond	400
Log Creek Pond	400
Florence, Great Pee Dee Lake	400
Greenville, Dilsey Pond	525
Ellis's pond	175
Harris's pond	350
Woods Pond	350
Greenwood, Cuffeetown Creek	350
Kathwood, Hollow Creek	800
Kershaw, Hilton's pond	150
Lane, Paker Pond	800
Montmorenci, Jones's pond	200
Ninety Six, Cotton Mill Pond	175
Orangeburg, Caw Caw Pond	300
Dukes's pond	800
Hughes's pond	600
Jamison's pond	400
Pine Creek Pond	800
Riddle's pond	200
Scott's pond	400
Ulmer's pond	400
Pelion, Cedar Creek Pond	600
Rock Hill, Fennell's pond	150
Mill pond	150
St. Mathews, Millwood Pond	450
Riley Pond	450
Seivern, Juniper Pond	800
Sumter, Cain's mill pond	200
Pocalla Lake	400
Rose Hill Mill Pond	400
Swansea, Rhird Pond	900
Trenton, Padgett's pond	200
Wedgefield, McRae Mill Pond	400
Westminster, Dickerson's pond	350
Windsor, Spring Branch	200
Winnsboro, Little River	400
South Dakota:	
Hermosa, Cold Spring Lake	37
Sioux City, Waters of South Dakota	5,100
Tennessee:	
Ashland City, Sycamore Creek	1,500
Bolivar, Ferguson's pond	800
Brunswick, Jones's pond	200
Cedar Hill, Red River, Sulphur Fork	2,600

Distribution of fish and eggs, fiscal year 1918—Continued.

SUNFISH—Continued.

Disposition.	Number.
Tennessee—Continued.	
Collierville, Grass View Pond	400
Roper's pond	400
Covington, Roane's pond	400
Davidson, Highland Lake	400
Erwin, Banner's pond	300
Ethridge, Tinsley's pond	1,000
Farner, Ironsburg Lake	400
Fulton, Glade Pond	600
Gadsden, Willow Pond	600
Germantown, Klein's pond	400
Kerrville, Cannon's pond	400
Leoma, Ferguson's pond	400
Lexington, Davis's pond	750
Manchester, Duck River, Barren Fork	1,200
Memphis, Goat Lake	600
Mont Eagle, Scruggs's pond	600
Nashville, Woodward's pond	200
Oakland, Mewborn's mill pond	400
Puryear, Atkins's pond	600
Selmer, Sunnyside Lake	600
Somerville, Walside Lake	800
Summitville, Big Meadow Pond	600
Tazewell, Sutton's pond	100
Virginia:	
Ashland, McCarsear Pond	200
Beaver Dam, Beaver Dam Lake	600
Harris's pond	150
Bedford, Thomas's pond	100
Wildman's pond	200
Wingfield's pond	200
Bland, Helveys Mill Creek Pond	200
Walkers Pond	300
Walkers Big Creek	400
Chase City, Lilly Pond	100
Terry's pond	100
Concord, Stratton's pond	200
Delvale, Coxes Creek	100
Stewart Pond	100
Dry Fork, Harper's pond	150
Emporia, Goodwyn's pond	300
Jones Pond	500
Turner Pond	400
Haysi, Russell Fork	100
Houston, Stony Branch Pond	100
Irwin, East Leake Pond	125
Lawrenceville, Great Creek	800
Midlothian, Morrissette's pond	100
Mila, Ice Pond	150
Mount Holly, Mount Holly Pond	150
Peake, Mill Pond	600
Petersburg, Dibbell Lake	400
Iveys Pond	400
Kutchan's pond	100
Wyatt's pond	200
Randolph, Devin's pond	100
Raphine, Hays Creek	400
Rectortown, Rawlings's pond	200
Rice, Meador's pond	200
Richmond, Altamont Farm Pond	200
Johnson's pond	200
Neuman's pond	100
Yahley's pond	300
Ridgeway, Jones's pond	100
Rose Hill, Shelburne Lake	100
Shadwell, Hemley's pond	100
Suffolk, Lake George	300
Lake Savage	300
Lake Tranquil	300
Norfleet Pond	600
Riddick's pond	300
Sutherlin, Baptist Pond	100
Birch Creek Pond	400
Sweet Hall, Custis Club Lake	500
Vinita, Vinita Pond	125
Waverly, Drewery Pond	500
Harrell-Gray Pond	400
Shady Grove Lake	400
Wellville, Beville's pond	100
Crows Pond	300
West Point, Marston's pond	400
Wytheville, Reed Creek	500
Yale, Spring View Pond	500
West Virginia:	
Dundon, Elk River	800
Holiday's Cove, Liberty Pond	20
Martinsburg, Patterson's pond	150
Morgantown, Cobun's Creek	1,200
Philippi, Lantz's pond	400
West Alexander, Blayney's pond	100
Wisconsin:	
Bagley, Mississippi River	[a] 1,000
Bay City, Mississippi River	[a] 475
Clear Lake, Poplar Grove Pond	200
Cross Plains, Stoppleworth's pond	300
Galesville, Lake Marinuka	500
Genoa, Mississippi River	[a] 1,740
Glenhaven, Mississippi River	[a] 300
La Crosse, Crooked Creek	1,000
Holmen Mill Pond	500
Mississippi River	[a] 226,300
Neshonoc Mill Pond	500
Ladysmith, Bog Lake	400
Superior, Amnicon Lake	2,100
Tunnel City, Idlewild Pond	400
West Bend, Silver Brook Pond	700
Woodyard, Mississippi River	[a] 200
Wyalusing, Mississippi River	[a] 800
Canal Zone: Gatun Lake, Gatun Lake	2,000
Total [b]	1,644,558

PIKE PERCH.

Connecticut:	
New Milford, Emerald Lake	†300,000
Wauregan, Woodchuck Hill Pond	†200,000
Illinois: New Boston, Mississippi River	[a] 84
Indiana:	
Leesburg, Oswego Lake	†300,000
Logansport, Eel River	†300,000
Fletcher Lake	†200,000
Wabash River	†300,000
Iowa: Fairport, Mississippi River	[a] 270
Kentucky:	
Burnside, Cumberland River	†1,200,000
Livingston, Rock Castle River	†1,200,000
Louisville, Ohio River	†400,000
Massachusetts:	
Lowell, Knopps Pond	†200,000
Newfield Pond	†300,000
Milford, St. Marys Lake	†100,000
Palmer, State fish commission	*5,000,000
Pittsfield, Onota Lake	†500,000
Michigan:	
Jones, Birch Lake	†300,000
Orchard Lake, Orchard Lake	†500,000
South Lyon, Crooked Lake	†300,000
Minnesota:	
Ely, Burntside Lake	†200,000
White Iron Lake	†150,000
Wolf Lake	†100,000

[a] Rescued from overflowed lands and restored to original waters.
[b] Exclusive of 2,985 lost in transit.

Distribution of fish and eggs, fiscal year 1918—Continued.

PIKE PERCH—Continued.

Disposition.	Number.
Minnesota—Continued.	
Homer, Mississippi River	a 1,360
Red Wing, Mississippi River	a 40
New Hampshire:	
Nashua, Old Pennichuch Pond	†400,000
Newport, Spectacle Pond	†300,000
Warren, State fish commission	*2,000,000
New York:	
Altamont, Normanskill Creek	†300,000
Au Sable Forks, Silver Lake	†400,000
New York, Aquarium	*504,000
Port Henry, Lake Champlain	†700,000
Riverside, Paradox Lake	†400,000
Schroon Lake	†400,000
Schenectady, Marlaville Pond	†200,000
Ohio:	
Berea, Kinney Lake	†300,000
Defiance, Maumee River	†400,000
Isle St. George, Lake Erie	†10,000,000
Kellys Island, Lake Erie	†5,000,000
Middle Bass, Lake Erie	†5,000,000
Millersburg, Martins Creek	†300,000
Salt Creek	†300,000
Wolf Creek	†300,000
Napoleon, Maumee River	†400,000
Port Clinton, Lake Erie	†5,000,000
Rhode Island: Georgiaville, Georgiaville Pond	†100,000
Vermont:	
Brandon, Lake Hortonia	†200,000
Burlington, State fish commission	*7,056,000
St. Catherine Lake, St. Catherine Lake	†300,000
Vermont—Continued.	
Swanton, Lake Champlain	†14,700,000
Wisconsin:	
Genoa, Mississippi River	a 200
Gordon, Bass Lake	†100,000
Blue Gill Lake	†100,000
Ox Lake	†200,000
Hawthorne, Poplar Lake	†100,000
Hayward, Bear Lake	†50,000
Como Lake	†100,000
Foster Lake	†100,000
Frazer Lake	†100,000
George Lake	†100,000
Moon Lake	†100,000
Namakagon Lake	†100,000
Silver Lake	†100,000
Iron River, Pike Lake	†300,000
Katinka, Murphy Lake	†150,000
Lake Millicent, Crystal Lake	†150,000
Pine Tree Lake	†100,000
Lake Nebagamon, Lake Minnesung	†100,000
Lake Nebagamon	†100,000
Laona, Birch Lake	†100,000
Long Lake, Stevens Lake	†750,000
Solon Springs, Island Lake	†100,000
Long Lake	†100,000
Superior, Amnicon Lake	†150,000
Three Lakes, Medicine Lake	†200,000
Total	*14,560,000 †56,000,000 1,954

YELLOW PERCH.

Arizona: Globe, Roosevelt Lake	500
Arkansas:	
Black Rock, Black River	a 17
Manson, Black River	a 65
Colorado: Wray, Olive Lake	225
Connecticut:	
Bristol, Jacklin Pond	†200,000
Forestville, Birge Pond	†300,000
Waterbury, Lake Winnemaug	†300,000
Illinois:	
Apple River, Apple River, North Branch	100
Blanding, Mississippi River	a 550
Freeport, waters of Illinois	2,075
Galena Junction, Mississippi River	a 2,550
Hanover, Mississippi River	a 1,490
Lena, Mammooser Lake	100
Meredosia, Illinois River	a 22,000
Mount Olive, Mount Olive Lake	750
New Boston, Mississippi River	a 83
Nora, Apple River, North Branch	50
Scales Mound, Mill Creek	100
Warren, Apple River, East Branch	150
Indiana:	
Columbus, Clifty Creek	225
Haw Creek	225
Little Sand Creek	225
White River	225
Marion, Gards Pond	250
Noblesville, White River	750
Vincennes, Wabash Lake	75
Iowa:	
Bellevue, Mississippi River	a 4,000
Cresco, Iowa River	600
Turkey River	600
Fairport, Mississippi River	a 50
Gravity, Dunkin's pond	100
Green Island, Mississippi River	a 2,700
Iowa Falls, Iowa River	975
Iowa—Continued.	
North McGregor, Mississippi River	a 3,950
Perry, Raccoon River	2,325
Pleasant Creek, Mississippi River	a 50
Rolfe, Sunset Hill Pond	200
Sny Magill, Mississippi River	a 200
Kentucky: Pikesville, Big Sandy River	100
Maine:	
Ellsworth, Jackson's pond	75
Hermon Pond, Hermon Pond	225
Maryland:	
Accokeek, Potomac River	†49,179,200
Annapolis, Hammond Pond	150
Severn River	375
Severn River Pond	75
Broad Creek, Potomac River	†7,900,000
McDaniel, Hemmersley Creek	100
Lovers Cove Creek	200
Miles River, Branch of	700
Pasadena, Nolen's pond	75
Piscataway, Potomac River	†51,431,300
Swan Creek, Potomac River	†4,618,000
Massachusetts:	
Athol, Pautaupaug Pond	†300,000
Concord, Punkatasset Pond	†300,000
Gardner, Burnside Pond	†200,000
Lee, Laurel Lake	†200,000
Lower Goose Pond	†200,000
Stockbridge Lake	†200,000
Upper Goose Pond	†200,000
Lowell, Keyes Pond	†200,000
Knapps Pond	†200,000
Long Pond	†200,000
Round Pond	†200,000
Westboro, Hockamocka Pond	†400,000
Sandra Pond	†500,000
Mexico: Parral, Lake Conchos	200
Michigan: Iron River, Sunset Lake	300

a Rescued from overflowed lands and restored to original waters.

Distribution of fish and eggs, fiscal year 1918—Continued.

YELLOW PERCH—Continued.

Disposition.	Number.
Minnesota:	
Homer, Mississippi River	a348,618
Red Wing, Mississippi River	a 2,350
Missouri:	
Neosho, Hickory Creek	†10,000
Joplin, Sloan's pond	32
Saginaw, Morsman's pond	32
New Jersey: Flemington, Fauss's pond	100
New York:	
Altamont, Normanskill Creek	†300,000
Cape Vincent, St. Lawrence River	†20,750,000
Cortland, Little York Lake	200
Tully Lake	200
Davenport Center, Sherman Lake	100
Grass Bay, St. Lawrence River	†10,000,000
Poplar Tree Bay, St. Lawrence River	†7,000,000
Round Lake, Round Lake	†200,000
Saratoga Springs, Artist Lake	†300,000
North Carolina: Raleigh, Neuscoco Pond	50
North Dakota: St. John, Lakes of Rolette County	1,040
Ohio: Lake View, Indian Lake	500
Oklahoma:	
Armstrong, Hatchery Ponds	†10,000
	100
Pawhuska, Buck Creek	400
Clear Creek	200
Pond Creek	200
Pennsylvania:	
Altoona, Juniata River	1,300
Canton, Lake Nepahwin	400
Ebensburg, Lake Rowena	300
Lloyd's pond	200
Everett, Juniata River, Raystown Branch	200
Mance, Bauman Pond	200
Whiteland, Valley Creek	450
Yardley, White's pond	450
South Dakota: Sioux City, Waters of South Dakota	1,400
Vermont: Swanton, Lake Champlain	†900,000
Virginia:	
Bedford, Rucker's pond	200
Dogue Creek, Potomac River	†11,200,500
Little Hunting Creek, Potomac River	†8,300,000
Mount Vernon, Potomac River	†2,600,000
Pohick, Potomac River	†4,100,000
Richmond, Northside Pond	180
Wytheville, Reed Creek, South Fork	100
Wisconsin:	
Bay City, Mississippi River	a 150
Elkhart Lake, Elkhart Lake	500
Genoa, Mississippi River	a 3,800
La Crosse, Mississippi River	a 43,725
Prairie du Chien, Mississippi River	a 500
Total b	†182,899,000
	459,282

WHITE PERCH.

Maine:	
Compass Lake, Compass Lake	†2,300,000
Hermon Pond, Hermon Pond	†600,000
Total	†2,900,000

WHITE BASS.

Arkansas:	
Black Rock, Black River	a 120
Browns Lake, Black River	a 6
Manson, Black River	a 155
Illinois:	
Apple River, Apple River, North Fork	130
Blanding, Mississippi River	a 4,900
Freeport, Waters of Illinois	1,625
Galena Junction, Mississippi River	a 4,850
Hanover, Mississippi River	a 3,050
Lena, Mammosser Lake	130
New Boston, Mississippi River	a17,494
Nora, Apple River, East Fork	130
Warren, Apple River, East Fork	650
Iowa:	
Bellevue, Mississippi River	a 35
Clayton, Mississippi River	a 25
Fairport, Mississippi River	a 211
Green Island, Mississippi River	a 2,500
Pleasant Creek, Mississippi River	a 500
Louisiana: Atchafalaya, Mississippi River	a 2,700
Minnesota: Homer, Mississippi River	a 7,320
Wisconsin:	
Genoa, Mississippi River	a 350
La Crosse, Mississippi River	380
Total	47,261

STRIPED BASS.

North Carolina: Weldon, Roanoke River	†14,349,000

a Rescued from overflowed lands and restored to original waters.
b Exclusive of 35 fingerlings lost in transit.

Distribution of fish and eggs, fiscal year 1918—Continued.

MACKEREL.

Disposition.	Number.	Disposition.	Number.
Massachusetts:		Massachusetts—Continued.	
Falmouth, Great Harbor	†1,770,000	Gosnold, Buzzards Bay	†1,869,000
Vineyard Sound	†1,009,000	Total	†4,648,000

COD.

Massachusetts:		Massachusetts—Continued.	
Beverly, Massachusetts Bay	†11,220,000	Woods Hole, Great Harbor	†3,817,000
Gloucester, Atlantic Ocean	†34,570,000	Little Harbor	†902,000
Rockport, Atlantic Ocean	†21,750,000		
Ipswich Bay	†5,400,000	Total	†77,659,000

POLLOCK.

Massachusetts:		Massachusetts—Continued.	
Beverly, Massachusetts Bay	†35,570,000	Rockport, Atlantic Ocean	†37,570,000
Gloucester, Atlantic Ocean	†124,410,000		
Manchester, Massachusetts Bay	†36,150,000	Total	†233,700,000

HADDOCK.

Massachusetts:		Massachusetts—Continued.	
Gloucester, Atlantic Ocean	†16,280,000	Rockport, Atlantic Ocean	†1,150,000
Ipswich Bay	†400,000	Total	†17,830,000

FLOUNDER.

Maine:		Massachusetts—Continued.	
Boothbay Harbor, Boothbay Harbor	†62,077,000	Falmouth, Waquoit Bay	†95,213,000
Linekins Bay	†459,382,000	West Falmouth Harbor	†31,213,000
Mill Cove	†9,745,000	Gloucester, Anisquam River	†12,000,000
West Boothbay Harbor	†453,493,000	Atlantic Ocean	†7,730,000
East Boothbay, Linekins Bay	†39,723,000	Gloucester Harbor	†75,610,000
Southport, Ebencook Harbor	†11,461,000	Ipswich Bay	†32,530,000
Pig Cove	†11,459,000	Gosnold, Buzzards Bay	†30,517,000
Townsend Gut	†50,485,000	Hadley Harbor	†192,421,000
Thomaston, Owls Head Bay	†15,280,000	Lagoon Pond	†79,485,000
Seal Harbor	†66,232,000	Vineyard Sound	†102,606,000
Massachusetts:		Manchester, Massachusetts Bay	†12,200,000
Beverly, Massachusetts Bay	†31,690,000	Provincetown, Provincetown Harbor	†19,737,000
Chilmark, Menemsha Pond	†45,342,000	Rockport, Atlantic Ocean	†8,770,000
Cundy Harbor, Hen Cove	†26,111,000	Seapit River, Waquoit Bay	†18,151,000
Ridleys Cove	†26,111,000	New York: Arverne, Jamaica Bay	†29,220,000
Falmouth, Deacons Pond Harbor	†49,728,000	Rhode Island:	
Eel Pond	†64,963,000	Wickford, Narragansett Bay	†20,426,000
Great Harbor	†88,760,000	Wickford Harbor	†92,328,000
Little Harbor	†23,501,000		
Quissett Harbor	†59,671,000	Total	†2,455,371,000

MISCELLANEOUS FISHES.

Arkansas:		Minnesota:	
Black Rock, Black River	a 378	Lake Pepin, Mississippi River	a140
Browns Lake, Black River	a 62	Red Wing, Mississippi River	a1,600
Manson, Black River	a 555	New Jersey: Hackensack, Zoo Park	300
Illinois: New Boston, Mississippi River	a 29,005	Wisconsin: Bay City, Mississippi River	a460
Iowa:			
Bellevue, Mississippi River	a 17,100	Total	100,200
Fairport, Mississippi River	a175		
Louisiana: Atchafalaya, Mississippi River	a 50,425		

aRescued from overflowed lands and restored to original waters.

Distribution of fish and eggs, fiscal year 1918—Continued.

LOBSTER.

Disposition.	Number.	Disposition.	Number.
Maine:		Maine—continued.	
Bass Harbor, Bass Harbor	†1,000,000	Phippsburg, Burnt Court Harbor	†1,000,000
Biddeford, Biddeford Pool	†1,000,000	The Basin	†1,000,000
Boothbay, Birch Isle Cove	†1,500,000	Port Clyde, Port Clyde Harbor	†2,000,000
Boothbay Harbor, Bayville Cove	†1,500,000	Portland, Peaks Isle Roads	†2,000,000
Boothbay Harbor	†680,000	Rockland, Rockland Harbor	†3,000,000
Murray Hill Cove	†2,500,000	Round Pond, Round Pond	†500,000
Sweets Cove	†1,000,000	St. George, Pleasant Point Gut	†4,000,000
Camden, Camden Harbor	†1,500,000	Sevan Isle, Mackerel Cove	†1,000,000
Cape Porpoise, Cape Porpoise	†1,500,000	Southport, Ebencook Harbor	†1,500,000
Castine, Hatches Cove	†2,000,000	South Thomaston, Owls Head Bay	†1,500,000
Cranberry Isle, Cranberry Isle Harbor	†1,000,000	Seal Harbor	†2,500,000
Cundy Harbor, Ridleys Cove	†2,000,000	Stockton Springs, Stockton Harbor	†2,000,000
Freeport, Mare Island Bay	†1,000,000	Stonington, Deer Isle Thoroughfare	†1,000,000
Friendship, Friendship Harbor	†1,000,000	Tennants Harbor, Tennants Harbor	†1,500,000
Gouldsboro, Prospect Harbor	†1,000,000	Vinal Haven, Carvers Harbor	†9,000,000
Isleboro, Turtle Head Cove	†1,000,000	West Bath, Hen Cove	†1,000,000
Kennebunk, Kennebunk Point Harbor	†1,500,000	Ridleys Cove	†1,000,000
Kittery, Kittery Harbor	†1,500,000	Yarmouth, Northeast Cove	†1,000,000
Lawry, Delanos Cove	†500,000	York Harbor, York Harbor	†1,500,000
Orrs Isle, Quohog Bay	†2,000,000	Washington: Rosario, Puget Sound	5,700 adults.
Pemaquid, Johns Bay	†2,000,000	Total[a]	†66,680,000 5,700 adults.

[a] Exclusive of 200 adults lost in transit.

SUMMARY OF THE DISPOSITION OF FISH RESCUED, FISCAL YEAR 1918.

Species.	Restored to original waters.	Delivered to applicants.
Black bass	123,275	242,149
Buffalofish	2,416,107	945
Carp	1,658,801	1,975
Catfish	12,580,634	138,296
Crappie	2,768,197	131,265
Drum	83,473	.....
Pike	105,434	974
Pike perch	1,954	.....
River herring	3,700,000	.....
Rock bass	385	5,555
Smallmouth bass	.....	2,433
Sunfish	1,249,623	143,912
Warmouth bass	7,970	.....
White bass	44,598	2,663
Yellow perch	436,358	22,565
Miscellaneous	100,200	.....
Total	25,277,309	692,732

DISTRIBUTION COSTS.

Statistics compiled from information given by car captains and messengers on the coupons of their mileage reports for the calendar year 1917 show that 22,880,148 fish were carried by the Bureau's cars during that period, 8,862,656 of which were distributed by messengers on detached trips from the cars; 206,984,057 fish were distributed by messengers direct from stations. In making the distribution, 102,867 miles were traveled by cars and 408,715 miles by messengers. The total cost of distributing 229,864,205 fish was $37,585.72, of which amount $27,457.44 was paid for transportation, $1,380.91 for incidentals, $4,628.72 for subsistence, and $4,118.65

for help. The average cost for distribution was a little over 16 cents per thousand fish.

The following table shows the average cost per 1,000 for distributing fry, fingerlings, and adult fishes for the calendar year 1917, not including the salaries of messengers:

METHOD OF DISTRIBUTION, BY STATIONS, SPECIES, NUMBER, AND SIZE OF FISH, AND COSTS.

DISTRIBUTION BY CAR MESSENGERS.[a]

Name of station.	Species.	Number of fish.	Size.	Total cost.	Average cost per thousand.	Miles paid.	Miles free.
Bozeman, Mont.	Trout	274,500	Fingerlings, 1-inch	$75.65	$0.275	1,142	.....
Do	do	205,000	Fingerlings, 1 to 3 inch	244.58	1.193	3,890	1,347
Do	do	116,650	Fingerlings, 3-inch	148.08	1.269	2,182	.....
Craig Brook, Me.	Salmon	673,600	Fry	114.62	.17	1,202	.....
Do	do	77,200	Fingerlings, 1-inch	57.99	.751	744	.....
Do	Trout	845,200	Fry	171.38	.202	2,565	.....
Do	do	2,000	Fingerlings, 1-inch	3.50	1.75	28	.....
Do	do	1,319	Fingerlings, 4-inch	11.53	8.741	241	.....
Erwin, Tenn.	do	48,000	Fingerlings, 1-inch	55.01	1.146	885	.....
Do	do	4,000	Fingerlings, 1½-inch	3.65	.91	76	.....
Do	do	34,000	Fingerlings, 1 to 2 inch	19.90	.586	416	.....
Do	do	94,000	Fingerlings, 2½-inch	15.20	.161	276	.....
Homer, Minn.	Pond fishes	690	Fingerlings, 1-inch	1.75	2.536	.....	.....
Do	do	5,052	Fingerlings, 1 to 2 inch	112.41	22.25	2,256	.....
Do	do	30,613	Fingerlings, 2-inch	200.96	6.564	3,674	.....
Do	do	45,512	Fingerlings, 3-inch	280.76	6.168	5,799	.....
Do	do	7,804	Fingerlings, 4-inch	138.68	17.77	3,547	.....
Do	do	3,070	Fingerlings, 5-inch	96.11	31.306	2,348	.....
Do	do	1,680	Fingerlings, 6-inch	41.29	24.577	828	.....
Do	do	70	Adults	13.06	186.571	377	.....
Do	do	5,735	Fingerlings, 1 to 6 inch	52.01	9.068	1,115	.....
Leadville, Colo.	Trout	694,000	Fingerlings, 1-inch	130.50	.188	752	3,747
Do	do	624,500	Fingerlings, 1 to 1½ inch	141.85	.227	452	6,029
Do	do	188,575	Fingerlings, 1 to 2½ inch	67.30	.356	728	1,009
Mammoth Spring, Ark.	Pond fishes	11,350	Fingerlings, 1-inch	72.89	6.422	1,157	.....
Do	do	6,600	Fingerlings, 2-inch	72.42	10.972	1,344	.....
Do	do	3,825	Fingerlings, 2 to 2½ inch	30.14	7.879	591	.....
Manchester, Iowa.	Trout	37,400	Fingerlings, 1-inch	24.30	.649	305	.....
Do	do	49,400	Fingerlings, 1 to 2 inch	6.20	.125	76	.....
Do	do	36,500	Fingerlings, 1 to 2½ inch	43.25	1.184	930	.....
Do	do	8,500	Fingerlings, 1½ inch	10.07	1.184	140	.....
Do	do	65,400	Fingerlings, 1½ to 3 inch	88.52	1.353	1,506	.....
Do	do	18,800	Fingerlings, 2-inch	17.54	.932	300	.....
Do	do	19,900	Fingerlings, 2½-inch	47.84	2.404	1,201	.....
Do	do	32,000	Fingerlings, 3-inch	76.58	2.393	1,387	.....
Do	do	400	Fingerlings, 4-inch	11.67	29.175	362	.....
Nashua, N. H.	do	11,600	Fingerlings, 1 to 2 inch	11.15	.961	157	.....
Do	do	90,000	Fingerlings, 1½-inch	127.75	1.419	2,459	.....
Do	do	16,400	Fingerlings, 2-inch	31.36	1.912	591	.....
Northville, Mich.	Pond fishes	37,160	Fingerlings, 1-inch	272.82	7.341	5,930	45
Do	Whitefish	3,600,000	Fry	23.10	.006	.....	1,352
Do	Trout	105,000	do	4.65	.044	102	.....
Quincy, Ill.	Pond fishes	3,500	Fingerlings, 1½-inch	36.67	10.477	780	.....
Do	do	6,780	Fingerlings, 1½ to 5 inch	54.18	7.991	973	.....
Do	do	7,397	Fingerlings, 1½-inch; Adult	76.18	10.298	1,569	.....
Do	do	13,116	Fingerlings, 2 to 2½ inch	92.78	7.073	1,480	179
Do	do	13,656	Fingerlings, 2½-inch; Adult	197.29	14.447	4,348	.....
Do	do	5,330	Fingerlings, 3-inch	88.39	16.583	1,848	.....
Do	do	4,758	Fingerlings, 3-inch; Adult	90.72	19.066	1,649	.....
Do	do	2,190	Fingerlings, 4-inch	38.23	17.456	807	.....
Do	do	1,085	Fingerlings, 4½ to 5 inch	27.55	25.391	506	.....
Spearfish, S. Dak.	Trout	20,900	Fingerlings, 1 to 3 inch	25.90	1.239	370	.....
Tupelo, Miss.	Pond fishes	900	Fingerlings, 3-inch	32.15	35.722	878	.....
Upper Mississippi[b]	do	5,000	Fingerlings, 1-inch	1.92	.384	46	.....
Do	do	400	Fingerlings, 1 to 4 inch	13.97	34.925	248	.....
Do	do	1,972	Fingerlings, 1 to 5 inch	18.74	9.503	388	.....
Do	do	9,850	Fingerlings, 1 to 2½ inch	49.25	5.00	833	.....

[a] Detached messenger shipments from cars. Cost in addition to "Distribution by car."
[b] La Crosse, Bellevue, and North McGregor.

METHOD AND DISTRIBUTION, BY STATIONS, SPECIES, NUMBER, AND SIZE OF FISH, AND COSTS—Continued.

DISTRIBUTION BY CAR MESSENGERS—Continued.

Name of station.	Species.	Number of fish.	Size.	Total cost.	Average cost per thousand.	Miles paid.	Miles free.
Upper Mississippi —Continued.	Pond fishes	20,710	Fingerlings, 1 to 3 inch.	143.83	6.944	2,770	.....
Do	do	36,230	Fingerlings, 2-inch	244.84	6.757	4,237	.....
Do	do	10,730	Fingerlings, 2 to 3 inch.	113.93	10.617	2,052	.....
Do	do	2,250	Fingerlings, 2 to 4 inch.	44.86	19.937	572	18
Do	do	13,298	Fingerlings, 2 to 5 inch.	171.71	12.912	3,084	28
Do	do	6,325	Fingerlings, 2½-inch	61.97	9.797	1,183	104
Do	do	52,061	Fingerlings, 3-inch	623.81	11.982	11,273	396
Do	do	31,235	Fingerlings, 3 to 4 inch.	339.19	10.859	6,209	1,546
Do	do	9,766	Fingerlings, 3 to 5 inch.	164.92	16.887	3,106	.....
Do	do	2,830	Fingerlings, 4-inch	74.17	26.208	1,496	.....
Do	do	1,320	Fingerlings, 4 to 5 inch.	34.44	26.09	368	.....
Do	do	1,460	Fingerlings, 5-inch	10.69	7.321	138	.....
Do	do	1,102	Adults	29.80	27.041	502	.....
White Sulphur, W. Va.	Trout	91,600	Fingerlings, 1½-inch	40.54	.442	610	.....
Do	do	212,900	Fingerlings, 2-inch	253.54	1.190	4,104	.....
Wytheville, Va	do	75,900	Fingerlings, 1 to 1½ inch.	105.90	1.395	1,650	88
Do	do	23,800	Fingerlings, 2-inch	107.30	4.508	2,226	.....
Do	do	34,800	Fingerlings, 2½-inch	53.32	1.532	882	.....
Do	do	4,500	Fingerlings, 3-inch	59.19	13.153	1,286	21

DISTRIBUTION BY STATION MESSENGERS.[a]

Baird, Calif	Trout	16,000	Fry	$97.20	$6.075	2,205	.....
Birdsview, Wash	do	9,000	Fingerlings, 1 to 1½ inch.	36.65	4.06	380	.....
Bozeman, Mont	Grayling	208,000	Fry	38.40	.184	456	939
Do	Trout	199,500	Fingerlings, 1-inch	83.20	.417	935	1,020
Do	do	183,750	Fingerlings, 1½-inch	97.85	.532	2,106	321
Do	do	224,200	Fingerlings, 1 to 2½ inch.	198.50	.885	3,157	1,626
Do	do	43,000	Fingerlings, 1 to 3 inch.	19.90	.462	98	709
Do	do	28,150	Fingerlings, 3-inch	86.70	3.079	700	2,848
Cape Vincent, N. Y	Lake Herring	20,000,000	Fry	64.40	.003	880	.....
Do	Pike perch	3,775,000	do	69.03	.018	1,770	.....
Do	Salmon	4,970	do	1.20	.241	.....	.....
Do	Trout	1,101,000	do	357.92	.325	9,218	.....
Do	Whitefish	7,000,000	do	142.98	.020	3,092	.....
Central Station	Trout	50	Adults	24.85	497.00	620	.....
Do	do	272	Fingerlings, 4-inch	3.72	13.676	22	.....
Do	do	2,000	Fingerlings, 1½-inch	2.20	1.10	36	.....
Do	Landlocked salmon.	36	Adults	40.29	1,119.16	965	.....
Do	Pearl roach	80	Fingerlings, 4½ to 5 inch.	9.48	118.50	111	.....
Do	Pike perch	1,500,000	Fry	41.93	.027	869	.....
Do	Whitefish	530,000	do	23.59	.037	628	.....
Clackamas, Oreg	Trout	179,000	Fingerlings, 1½-inch	137.20	.766	3,125	22
Do	do	59,500	Fingerlings, 3-inch	150.25	2.525	3,600	33
Do	do	6,000	Fingerlings, 3½-inch	25.20	4.20	635	.....
Cold Springs, Ga	Pond fishes	161,262	Fingerlings, 1-inch	253.24	1.57	4,843	.....
Do	do	102,950	Fingerlings, 1½-inch	339.19	3.294	6,256	.....
Do	do	31,075	Fingerlings, 1 to 2 inch.	119.80	3.855	2,318	.....
Do	do	5,687	Fingerlings, 1 to 2½ inch.	50.36	8.855	1,133	.....
Do	do	15,146	Fingerlings, 1½ to 2 inch.	81.19	5.36	1,691	.....
Do	do	19,073	Fingerlings, 1½ to 3 inch.	104.62	5.485	2,021	.....
Do	do	9,072	Fingerlings, 1½ to 5 inch.	62.89	6.932	1,087	.....
Duluth, Minn	Trout	5,784,000	Fry	18.40	.002	.....	.....
Do	do	2,718,000	Fingerlings, 1-inch	78.10	.028	.....	.....
Craig Brook, Me	Salmon	1,979,000	Fry	159.05	.08	520	.....
Edenton, N. C	Pond fishes	16,100	do	38.15	2.369	872	.....
Do	do	16,900	Fingerlings, 1-inch	111.10	6.573	2,393	.....
Do	do	9,200	Fingerlings, 2-inch	65.90	7.163	1,755	.....
Do	do	8,000	Fingerlings, 3-inch	111.23	13.903	1,887	.....
Erwin, Tenn	Trout	62,000	Fingerlings, 1-inch	34.86	.562	496	.....
Do	do	19,000	Fingerlings, 1½ to 2 inch.	9.44	.496	128	.....
Do	do	13,000	Fingerlings, 2-inch	10.79	.83	243	.....
Do	do	6,000	Fingerlings, 2½-inch	9.94	1.656	128	.....
Do	do	24	Adults	5.35	222.916	98	.....
Do	Pond fishes	39,250	Fry	177.92	4.532	4,068	.....

[a] Distribution by station messengers includes cost of making distribution direct from the station without a car. This distribution is usually to nearby points.

METHOD OF DISTRIBUTION, BY STATIONS, SPECIES, NUMBER, AND SIZE OF FISH, AND COSTS—Continued.

DISTRIBUTION BY STATION MESSENGERS—Continued.

Name of station.	Species.	Number of fish.	Size.	Total cost.	Average cost per thousand.	Miles paid.	Miles free.
Erwin, Tenn.—Con.	Pond fishes	1,000	Fingerlings, 1-inch	$25.80	$25.80	604	
Do	do	4,000	Fingerlings, 1½-inch	46.94	11.735	1,081	57
Do	do	19,000	Fingerlings, 1 to 2 inch	143.03	7.527	3,310	
Do	do	13,265	Fingerlings, 1½ to 2 inch	97.84	7.375	2,058	
Do	do	1,070	Fingerlings, 3 to 4 inch	51.52	48.084	1,105	
Do	do	400	Adults	5.64	14.10	92	
Green Lake, Me	Landlocked salmon.	355,000	Fry	33.75	.095	466	
Do	do	30,000	Fingerlings, 1-inch	37.40	1.246	413	
Do	Smelt	20,000,000	Fry	25.25	.001	458	
Do	Trout	228,600	do	8.00	.034	70	
Homer, Minn	Pike perch	9,720,000	do	155.97	.016	3,177	
Do	Pond fishes	2,000	Fingerlings, 1-inch	(a)			
Do	do	1,200	Fingerlings, 2-inch	26.55	22.125	579	
Do	do	1,600	Fingerlings, 2½-inch	18.76	11.725	260	
Do	do	2,700	Fingerlings, 3-inch	17.16	6.255	204	
Do	do	3,770	Fingerlings, 2 to 4 inch	28.63	7.594	522	
Do	do	1,450	Fingerlings, 3 to 4 inch	(a)			
Do	do	1,000	Fingerlings, 1 to 5 inch	7.17	7.17	54	
Do	do	2,175	Fingerlings, 3 to 5 inch	(a)			
Do	do	1,404	Fingerlings, 1½-inch Adults	44.77	31.887	1,109	
Do	Trout	144,530	Fingerlings, 1-inch	132.20	.914	1,973	
Leadville, Colo	Grayling	80,000	Fry	16.95	.211	120	479
Do	Pond fishes	1,500	Fingerlings, 2½ to 3 inch	25.60	17.066	404	309
Do	do	1,468	Fingerlings, 2½-inch Yearlings	15.50	10.558		872
Do	Trout	2,238,000	Fingerlings, 1-inch	187.05	.083	10	8,359
Do	do	696,400	Fingerlings, 1½-inch	169.80	.243	134	6,602
Do	do	98,000	Fingerlings, 1 to 2½ inch	8.40	.085		440
Do	do	58,500	Fingerlings, 2-inch	6.90	.117		391
Do	do	10,000	Fingerlings, 2½-inch	8.00	.80		460
Do	do	31,500	Fingerlings, 1½ to 3 inch	3.50	.111		142
Do	do	28	Adults	4.25	151.785		304
Louisville, Ky	Pond fishes	2,400	Fingerlings, 1 to 2 inch	37.92	15.80	928	
Do	do	1,800	Fingerlings, 2-inch	9.64	5.355	200	
Mammoth Spring, Ark.	do	5,400	Fingerlings, 1-inch	25.52	.472	558	
Do	do	15,384	Fingerlings, 2-inch	194.67	12.654	3,998	
Do	do	640	Fingerlings, 3-inch	44.26	69.15	980	
Do	do	1,272	Fingerlings, 2 to 5 inch	40.56	31.88	690	
Do	do	158	Adults	42.63	276.139	973	
Manchester, Iowa	do	1,250	Fingerlings, 1 to 2 inch	3.03	2.42	94	
Do	do	1,015	Fingerlings, 3 to 5 inch	12.90	12.70	332	
Do	Trout	2,000	Fingerlings, 1½-inch	5.97	2.985	194	
Do	do	2,000	Fingerlings, 2-inch	7.55	3.775	192	
Do	do	1,900	Fingerlings, 3-inch	(b)			150
Nashua, N. H	Pond fishes	3,000	Fry	6.09	2.03	144	
Do	do	1,500	Fingerlings, 1-inch	10.34	6.893	258	
Do	do	1,100	Fingerlings, 1½-inch	12.83	11.663	286	
Do	Trout	566,000	Fingerlings, 1-inch	144.09	.254	3,135	
Do	do	265,500	Fingerlings, 1½-inch	178.75	.673	4,741	
Do	do	24	Adults	6.67	277.916	136	
Neosho, Mo	Pond fishes	21,420	Fingerlings, 1 to 3 inch	92.72	4.328	2,496	
Do	do	7,285	Fingerlings, 2-inch	77.14	10.588	2,478	
Do	do	11,656	Fingerlings, 2 to 3 inch	66.01	5.663	2,145	
Do	do	2,220	Fingerlings, 3-inch	42.75	19.256	1,158	
Do	do	1,606	Fingerlings, 2 to 4 inch	12.00	7.471	348	
Do	do	248	Fingerlings, 5-inch	15.61	62.943	372	
Do	Trout	42,850	Fingerlings, 2-inch	96.13	2.243	2,022	
Do	do	5,000	Fingerlings, 3 to 4 inch	14.31	2.862	288	
Do	do	4,585	Fingerlings, 4-inch	22.82	4.977	389	
Do	do	2,506	Fingerlings, 5 to 6 inch	78.80	31.444	734	
Northville, Mich	Pike perch	7,350,000	Fry	37.75	.005	2,567	
Do	Whitefish	1,200,000	do	6.65	.005	194	
Do	Pond fishes	107,000	do	59.53	.556	150	2,353
Do	do	30,400	Fingerlings, 1-inch	134.23	4.415	2,470	650
Do	do	1,500	Fingerlings, 2-inch	3.95	2.633		326
Do	do	450	Fingerlings, 2½-inch	18.33	40.733	604	
Do	Trout	644,000	Fry	141.54	.219	2,081	3,125
Do	do	122,000	Fingerlings, 1-inch	28.90	.236		1,797

a Station delivery.

b No costs.

METHOD OF DISTRIBUTION, BY STATIONS, SPECIES, NUMBER, AND SIZE OF FISH, AND COSTS—Continued.

DISTRIBUTION BY STATION MESSENGERS—Continued.

Name of station.	Species.	Number of fish.	Size.	Total cost.	Average cost per thousand.	Miles paid.	Miles free.
Orangeburg, S. C.	Pond fishes	6,175	Fingerling, 1-inch	$42.40	$6.866	753	.....
Do	do	4,985	Fingerlings, 1 to 3 inch.	42.05	8.435	929	.....
Do	do	6,650	Fingerlings, 2-inch	21.60	3.248	362	.....
Do	do	1,475	Fingerlings, 2 to 3 inch.	12.60	8.542	249	.....
Put in Bay	Pike perch	4,500,000	Fry	120.71	.026	2,007	.....
Quincy, Ill	do	1,390,000	do	77.33	.055	2,040	.....
Do	Pond fishes	2,300	Fingerlings, 1½-inch	26.29	11.43	450	.....
Do	do	5,245	Fingerlings, 2-inch	41.96	8.00	803	.....
Do	do	4,250	Fingerlings, 1 to 3½ inch.	60.26	14.178	1,071	.....
Saratoga, Wyo	do	33,000	Fingerlings, 1 to 3 inch.	6.00	.181	20	300
Do	do	64,000	Fingerlings, 1½ to 2 inch.	20.90	.326	64	876
Do	do	56,500	Fingerlings, 2-inch	15.30	.270	232	232
Do	do	6,000	Fingerlings, 1½ to 3 inch.	9.10	1.516	20	530
St. Johnsbury, Vt.	Pike perch	1,700,000	Fry	39.06	.022	920	.....
Do	Yellow and pike perches.	18,899,000	do	259.32	.013	5,096	.....
Do	Pond fishes	2,000	Fingerlings, 1 to 2 inch.	39.32	19.66	660	.....
Do	do	12,508	Fingerlings, 1 to 3 inch.	101.49	8.114	1,910	.....
Do	do	8,910	Fingerlings, 2 to 3 inch.	116.48	13.072	2,142	.....
Do	do	2,178	Fingerlings, 3-inch	99.58	45.72	1,926	.....
Do	Trout	1,709,250	Fry	263.62	.154	4,329	15
Do	do	325,772	Fingerlings, 1-inch	105.51	.323	2,111	.....
Do	do	51,775	Fingerlings, 2-inch	106.81	2.062	1,434	.....
Do	do	8,869	Fingerlings, 2 to 3 inch.	31.87	3.593	677	.....
Do	do	4,684	Fingerlings, 3-inch	11.87	2.534	317	.....
Do	do	500	Fingerlings, 4-inch Adults	6.98	13.96	330	.....
Spearfish S. Dak.	do	777,800	Fry	327.78	.421	6,307	34
Do	do	150,000	Fry to fingerlings, 1-inch	54.44	.361	930	.....
Do	do	493,935	Fingerlings, 1-inch	4.75	.009	.....	.....
Do	do	157,500	Fingerlings, 1 to 1½ inch.	125.39	.796	2,279	.....
Do	do	18,000	Fingerlings, 1 to 2½ inch.	5.50	.305	78	.....
Do	do	5,500	Fingerlings, 1½-inch	(a)	.....	.....	.....
Do	do	19,500	do	14.71	.754	154	.....
Do	do	10,950	Fingerlings, 2-inch	17.13	1.564	264	.....
Do	do	39,150	Fingerlings, 2½-inch	19.94	.509	358	.....
Do	do	9,625	Fingerlings, 3-inch	12.91	1.341	154	.....
Tupelo, Miss	Pond fishes	153,000	Fry	136.90	.894	4,106	.....
Do	do	105,500	Fry to fingerlings, 1-inch.	207.12	1.963	4,548	.....
Do	do	51,200	Fingerlings, 1-inch	230.98	4.511	4,998	.....
Do	do	13,600	Fingerlings, 1 to 1½ inch.	110.16	8.10	2,235	.....
Do	do	14,795	Fingerlings, 1 to 3 inch.	105.55	7.134	2,260	.....
Do	do	16,405	Fingerlings, 1 to 4 inch.	163.07	9.94	2,621	.....
Do	do	6,115	Fingerlings, 1 to 5 inch.	71.77	11.736	1,537	.....
Do	do	8,265	Fingerlings, 1-inch Yearlings	107.50	13.006	1,853	.....
Do	do	42,369	Fingerlings, 2-inch	294.21	6.944	5,969	.....
Do	do	22,665	Fingerlings, 2 to 8 inch.	375.41	16.563	7,050	.....
Do	do	7,269	Fingerlings, 3 to 5 inch.	199.89	27.498	4,033	.....
Do	do	2,087	Fingerlings, 4 to 7 inch.	131.48	62.999	2,705	.....
Do	do	1,950	Fingerlings, 5-inch	136.97	70.241	2,729	.....
Do	do	950	Fingerlings, 6-inch	52.87	55.652	1,224	.....
Do	do	310	Adults	58.82	189.741	1,405	.....
White Sulphur, W. Va.	do	70,000	Fry	63.15	.902	1,364	.....
Do	do	2,200	Fingerlings, 2-inch	24.70	11.227	658	.....
Do	Trout	20,000	Fingerlings, 1½-inch	16.10	.805	282	.....
Do	do	43,500	Fingerlings, 1½ to 2 inch.	13.75	.316	224	.....
Do	do	1,811	Fingerlings, 1½-inch Adults	20.21	11.159	562	.....
Do	do	25,000	Fingerlings, 2-inch	50.70	2.028	1,038	.....
Do	do	13,650	Fingerlings, 2 to 2½ inch.	94.72	6.939	2,142	.....
Do	do	10,125	Fingerlings, 2½-inch	92.49	9.134	2,218	.....
Do	do	7,550	Fingerlings, 2 to 4 inch.	92.91	12.305	2,134	.....
Do	do	4,800	Fingerlings, 4-inch	40.45	8.427	804	.....
Do	do	1,260	Yearlings	7.90	6.269	190	.....
Woods Hole, Mass.	Flatfish	85,438,000	Fry	75.68	.001	900	.....
Wytheville, Va.	Pond fishes	42,099	Fingerlings, 1 to 5 inch.	298.38	7.087	7,525	.....
Do	do	8,220	Fingerlings, 2 to 3 inch.	91.36	11.114	1,994	.....
Do	Trout	100,500	Fingerlings, 1 to 3 inch.	74.56	.741	1,068	.....

a Station delivery.

METHOD OF DISTRIBUTION, BY STATIONS, SPECIES, NUMBER, AND SIZE OF FISH, AND COSTS—Continued.

DISTRIBUTION BY CARS.[a]

Name of station.	Species.	Number of fish.	Size.	Total cost.	Average cost per thousand.	Miles paid.	Miles free.
Bozeman, Mont.	Trout	1,092,376	Fingerlings, 1 to 3 inch.	$788.60	$0.721	3,110	2,380
Craig Brook, Me.	Salmon	3,242,000	Fry	260.60	.08	1,766	.....
Do	Trout	1,766,100	Fry to fingerlings, 1 to 4 inch	623.49	.353	2,164	.....
Erwin, Tenn.	do	416,000	Fingerlings, 1 to 2½ inch.	459.91	1.105	1,744	.....
Green Lake, Me.	Salmon	3,936,765	Fry	329.75	.083	1,552	.....
Homer, Minn.	Pond fishes	30,168	Fingerlings, 1 to 6 inch.	300.05	9.945	1,469	.....
Leadville, Colo.	Trout	1,703,078	Fingerlings, 1 to 3½ inch.	232.47	.136	809	6,948
Mammoth Spring, Ark.	Pond fishes	37,475	Fingerlings, 1 to 2½ inch.	649.80	17.312	2,356	.....
Manchester, Iowa.	Trout	623,400	Fingerlings, 1 to 3 inch.	615.59	.987	4,236	.....
Nashua, N. H.	do	179,300	Fingerlings, 1½ to 2 inch.	822.23	4.585	3,643	.....
Northville, Mich.	Pond fishes	48,850	Fingerlings, 1 to 3 inch.	532.00	10.890	2,743	.....
Do	Trout	1,787,000	Fry	455.52	.254	1,662	146
Do	Whitefish	6,000,000	do	163.75	.027	282	.....
Quincy, Ill.	Pond fishes	84,175	Fingerlings, 1-inch; Adults	1,346.45	15.995	7,242	.....
Spearfish, S. Dak.	Trout	249,375	Fingerlings, 2½ to 3 inch.	572.47	2.295	3,524	.....
Tupelo, Miss.	Pond fishes	3,915	Fingerlings, 3-inch; Adults	237.95	60.779	1,071	.....
Upper Mississippi[b]	do	395,739	Fingerlings, 1 to 6 inch.	6,849.63	17.308	38,206	544
Do	do	232	Adults	174.65	752.801	1,023	.....
White Sulphur, W. Va.	Trout	856,300	Fingerlings, 1½ to 2 inch.	1,956.11	2.284	9,283	140
Wytheville, Va.	do	427,900	Fingerlings, 1 to 3 inch.	1,143.01	2.671	4,762	62

[a] Distribution by cars shows cost of transporting fish to destination or until delivered to car messenger.
[b] La Crosse, Bellevue, and North McGregor.

A COMPARATIVE STATEMENT OF COSTS OF DISTRIBUTION BY MESSENGERS FOR CALENDAR YEARS 1916 AND 1917.

[NOTE.—Items that would afford no comparison have been omitted.]

DISTRIBUTION BY CAR MESSENGERS.[a]

Name of station.	Species.	Size.	Average cost per thousand.		Mileage, 1916.		Mileage, 1917.	
			1916	1917	Paid.	Free.	Paid.	Free.
Bozeman, Mont.	Trout	Fingerlings, 1-inch	$1.197	$0.275	5,596	830	1,142	.....
Do	do	Fingerlings, 3-inch	4.69	1,269	2,013	.....	2,182	.....
Craig Brook, Me.	do	Fry	.262	.202	1,008	.....	2,565	.....
Do	Salmon	do	.58	.17	43	.....	1,202	.....
Leadville, Colo.	Trout	Fingerlings, 1 to 3 inch.	.339	.225	2,634	15,843	1,932	10,785
Manchester, Iowa	do	Fingerlings, 1 to 4 inch.	1.01	1.214	7,234	.....	6,207	.....
Northville, Mich.	do	Fry	.253	.044	1,271	5,343	102	.....
Do	Pond fishes	Fingerlings, 1 to 2 inch.	7.12	7.341	10,742	72	5,930	45
Quincy, Ill.	do	Fingerlings, 1 to 6 inch.	18.285	12.142	31,921	.....	13,960	179
Spearfish, S. Dak.	Trout	Fingerlings, 1 to 3 inch.	2.16	1.239	1,510	.....	370	.....
Upper Mississippi River.	Pond fishes	Fingerlings, 1 to 6 inch.	10.432	10.276	27,475	442	38,003	2,092
Do	do	Adults	28.94	27.041	1,777	.....	502	.....
White Sulphur, W. Va.	Trout	Fingerlings, 1 to 4 inch.	1.116	.965	6,904	.....	4,714	.....
Wytheville, Va.	do	Fingerlings, 1 to 3 inch.	1.03	2.343	4,018	92	6,044	109

[a] Detached messenger shipments from cars.

A COMPARATIVE STATEMENT OF COSTS OF DISTRIBUTION BY MESSENGERS FOR CALENDAR YEARS 1916 AND 1917—Continued.

DISTRIBUTION BY STATION MESSENGERS.[a]

Name of station.	Species.	Size.	Average cost per thousand.		Mileage, 1916.		Mileage, 1917.	
			1916	1917	Paid.	Free.	Paid.	Free.
Baird, Calif.	Trout	Fry	$4.578	$6.075	1,403	.....	2,205	.....
Birdsview, Wash.	..do..	..do..	1.99	4.06	2,016	.....	380	.....
Bozeman, Mont.	..do..	Fingerlings, 1-inch	1.069	.417	1,162	.....	935	1,020
Do.	..do..	Fingerlings, 1½-inch	.608	.532	3,134	3,712	2,106	321
Do.	..do..	Fingerlings, 2-inch	.889	.885	615	.....	3,157	1,629
Do.	..do..	Fingerlings, 2½-inch	3.72	.462	137	.....	98	709
Do.	Grayling	Fry	.107	.184	.....	.....	456	939
Cape Vincent, N. Y.	Whitefish	..do..	.009	.020	2,278	.....	3,092	.....
Do.	Pike perch	..do..	.012	.018	2,530	.....	1,870	.....
Do.	Trout	..do..	.397	.325	8,426	31	9,218	.....
Central Station.	Pike perch	..do..	.027	.027	2,197	.....	869	.....
Clackamas, Oreg.	Trout	Fingerlings, 1½ to 3 inch.	.995	1.205	2,544	50	3,600	55
Duluth, Minn.	..do..	Fry	.057	.002	.....	.....	.....	.....
Edenton, N. C.	Pond fishes	..do..	7.142	2.369	2,785	.....	872	.....
Do.	..do..	..do..	9.896	6.573	5,507	31	2,393	.....
Erwin, Tenn.	Trout	Fingerlings, 1 to 3 inch.	1.67	.650	15,413	.....	995	.....
Do.	Pond fishes	Fingerlings, 1 to 4 inch.	10.97	6.999	7,051	.....	12,226	.....
Green Lake, Me.	Smelt	Fry	.308	.001	2,248	.....	458	.....
Do.	Salmon	..do..	.484	.095	304	.....	466	.....
Do.	Trout	..do..	.034	.034	56	.....	70	.....
Homer, Minn.	Pike perch	..do..	.212	.016	1,114	.....	3,177	.....
Do.	Pond fishes	Fingerlings, 1 to 5 inch.	15.91	6.182	12,362	.....	1,619	.....
Leadville, Colo.	Trout	Fingerlings, 1 to 3 inch.	.111	.122	.....	8,804	144	6,394
Louisville, Ky.	Pond fishes	Fingerlings, 1 to 2 inch.	8.49	11.323	6,090	.....	1,128	.....
Nashua, N. H.	Trout	Fingerlings, 1-inch	4.238	.254	647	.....	3,135	.....
Do.	..do..	Adults	247.00	277.92	136	.....	136	.....
Do.	Pond fishes	Fry	.70	2.03	28	.....	144	.....
Mammoth Springs, Ark.	..do..	Fingerlings, 1 to 2 inch.	13.13	10.594	12,235	.....	4,556	.....
Do.	..do..	Adults	403.05	276.14	1,770	.....	973	.....
Neosho, Mo.	..do..	Fingerlings, 1 to 6 inch.	7.23	5.215	15,095	.....	12,430	.....
Northville, Mich.	Pike perch	Fry	.005	.005	25	366	.....	2,567
Do.	Whitefish	..do..	.008	.005	.....	458	.....	194
Do.	Pond fishes	..do..	.953	.556	3,641	3,594	150	2,353
Do.	..do..	Fingerlings, 1 to 2 inch.	7.54	4.331	371	1,995	2,470	976
Do.	Trout	Fingerlings, 1-inch	1.13	.236	532	2,707	.....	1,796
Quincy, Ill.	Pike perch	Fry	.021	.055	825	.....	2,040	.....
Saratoga, Wyo.	Trout	Fingerlings, 1 to 2 inch.	.624	.274	4,463	1,324	316	1,408
St. Johnsbury, Vt.	Pike perch	Fry	.006	.022	5,936	.....	920	.....
Do.	Pond fishes	..do..	.61	.013	264	.....	5,096	.....
Do.	..do..	Fingerlings, 1 to 3 inch.	24.392	13.903	1,206	.....	6,638	.....
Do.	Trout	Fry	.213	.154	5,435	.....	4,329	15
Do.	..do..	Fingerlings, 1 to 3 inch.	.972	.654	7,390	58	4,539	15
Spearfish, S. Dak.	..do..	Fingerlings, 1 to 2 inch.	.363	.218	3,252	.....	2,511	.....
Tupelo, Miss.	Pond fishes	Fry	.759	.894	1,918	.....	4,106	.....
Do.	..do..	Fingerlings, 1 to 6 inch.	4.852	10.436	13,335	44	37,361	.....
White Sulphur, W. Va.	..do..	Fry	1.298	.902	1,649	.....	1,364	.....
Do.	Trout	Fingerlings, 1 to 2 inch.	1.674	.910	5,718	.....	1,544	.....
Woods Hole, Mass.	Flatfish	Fry	.001	.001	859	72	900	.....
Wytheville, Va.	Pond fishes	Fingerlings, 1 to 6 inch.	7.265	7.745	7,395	.....	9,519	.....
Do.	Trout	Fingerlings, 1 to 3 inch.	1.95	1.068	3,531	.....	1,068	.....

[a] Distribution direct from the station without a car.

FISH LAWS OF STATES BORDERING ON MISSISSIPPI AND OHIO RIVERS

A DIGEST OF STATUTES RELATING TO THE PROTECTION OF FISHES AND OTHER COLD-BLOODED AQUATIC ANIMALS

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Appendix II to the Report of the U. S. Commissioner of Fisheries for 1918

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INTRODUCTION.

In 1917 there was issued a digest of laws of Mississippi River States.[a] This is now revised to January 1, 1919, and extended to cover all States touching the Ohio River, thus taking in Indiana, Ohio, West Virginia, and Pennsylvania. Some additional information has been inserted because of repeated inquiries received during the past two years.

In order to keep the pamphlet within reasonable bounds certain subjects have usually been omitted. These are:

(*a*) Declarations that the title to fish and other wild animals is in the State.

(*b*) Prohibitions against contamination of waters. The subject of pollution has been covered in a comprehensive manner by Public Health Bulletin No. 87 of the United States Public Health Service, entitled "Stream Pollution," prepared by Stanley D. Montgomery and Earle B. Phelps.

(*c*) Special provisions for counties and other subdivisions, except in some cases where they are evidently of interest to a considerable number of people.

(*d*) Complicated details of restrictions on commercial fishing in some cases, though an effort has been made to indicate all laws on commercial fresh-water fishing.

(*e*) Laws for salt-water fishing.

(*f*) Penalties, administration, and procedure, including authority to arrest, seize unlawful implements, rewards for information as to violations, forgery of licenses, provisions for witnesses, limitations on times within which actions may be commenced, sale or destruction of things confiscated, and disposition of fines, fees, or other payments to officials.

(*g*) Requirement that licenses be available for exhibition to wardens at the time of fishing.

(*h*) Laws against having prohibited tackle in possession and against having fish in possession smaller than the legal limit, or during closed seasons, or in excess of bag limit, or if caught unlawfully. These provisions are of the greatest importance as aids to enforcement, but ordinarily they do not interest the law-abiding citizen.

[a] Emerson Stringham: Fish Laws of Mississippi River States. Report, U. S. Commissioner of Fisheries for 1916, Appendix IV, document No. 840, 16 p. 1917.

(*i*) Authorization for State officials to propagate and rescue fish or assist in stocking waters, or to take fish for scientific purposes.

(*j*) Provisions declaring it a crime to remove fish from the nets of another.

The omission of provisions as to administration is not due to a belief that these are of minor importance. Probably they are as well worth attention as the provisions for size limits and other matters. In most fields of legislation efficient administration is now recognized to be at least of equal importance with wise substantive provisions. But the question of administration is so different that it seems better not to attempt to combine it with this brief treatment of closed seasons and such matters. Of the 14 States under consideration only Illinois (25, 46), Minnesota (4761), and Pennsylvania (1903, act 92) have statutory provision for officials concerned exclusively with fisheries.

For subjects not covered in this digest, for amendments made after 1918, and for the texts of the laws that are digested herein, the statutes, or the pamphlet copies thereof, may be consulted. Pamphlets are prepared in each of these 14 States, except Mississippi. It is understood that they may be obtained from the following sources:

Arkansas.—The game and fish commission, Little Rock.
Illinois.—The chief game and fish warden, Springfield.
Indiana.—The commissioner of fisheries and game, Indianapolis.
Iowa.—The State fish and game warden, Spirit Lake.
Kentucky.—The fish and game commission, Frankfort.
Louisiana.—The department of conservation, New Orleans.
Minnesota.—The State game and fish commissioner, St. Paul.
Missouri.—The State fish commission, 3311 Chippewa Street, St. Louis.
Ohio.—The chief warden, secretary of agriculture, Columbus.
Pennsylvania.—The commissioner of fisheries, Harrisburg.
Tennessee.—The department of game and fish, Nashville.
West Virginia.—The forest, game, and fish warden, Philippi.
Wisconsin.—The State conservation commission, Madison.

This digest is based upon an examination of session laws and official or semiofficial compilations thereof. While the examination went to these sources in all cases, the references made by numbers in parentheses are to sections of the pamphlet copies of the laws issued by the State game departments, except in some cases where the year of enactment is given, and excepting Indiana and Mississippi; these numbers are the same as those given in the sources mentioned, except for Iowa and West Virginia. In the Indiana pamphlet most of the sections are without numbers, and references herein not otherwise indicated are to Burns's Annotated Statutes (1914). Mississippi has no pamphlet edition of its game and fish laws, and references are to Hemingway's Annotated Code (1917); the 1918 session of the Legislature of Mississippi did not make any amendments.

I. STATE AUTHORITY IN INTERSTATE WATERS.

It is a common belief among Mississippi River fishermen, in some localities, that the States have no authority to protect fish on that river because, in their expression, it is "a Government water." The belief is wholly without legal basis, and in those regions where the

State wardens have diligently enforced the law the fishermen do not seriously entertain this opinion. It arises chiefly from laxity, past or present, on the part of State officials.

The Mississippi River is a "Government" river in the sense that questions of navigation are subject to the jurisdiction of the Federal Government. But it was long ago settled by the United States Supreme Court that the States may protect the fisheries of navigable waters. In the case of *Smith* v. *Maryland* (18 Howard, 71 (1855)) that court decided an appeal from a conviction for dredging oysters in violation of the law of Maryland. The accused, Isaac R. Smith, owner of the sloop *Volant*, contended that the law of the State of Maryland was repugnant to that part of the United States Constitution which grants to Congress the power to regulate commerce among the States. In that case not only were the operations carried on in the navigable waters of Chesapeake Bay, but the ship was enrolled and licensed by the United States to be employed in the coasting trade and fisheries. The court affirmed the conviction, maintaining that the State holds the property in the soil under the waters for the conservation of the public rights of fishery therein, and may regulate the modes of that enjoyment so as to prevent the destruction of the fishery. "In other words, it may forbid all such acts as would render the public right less valuable or destroy it altogether."

A later Supreme Court case, *Manchester* v. *Massachusetts* (139 U. S., 240 (1890)), was argued for the fisherman by one of the leaders of the bar—Joseph H. Choate. This eminent counselor said: "We do not question the right of the State to regulate its own fisheries within its own soil or tidewaters." He acknowledged that within the tidewaters there has been no grant of power over the fisheries to the United States; but he argued that the State had no jurisdiction upon the ocean, even within 3 miles offshore. The court, however, decided in favor of the State of Massachusetts, holding that the State possessed authority to prohibit the use of various kinds of nets in the navigable waters of Buzzard's Bay. Quoting the language of the same court in an earlier opinion, it said:

> The title thus held is subject to the paramount right of navigation, the regulation of which, in respect to foreign and interstate commerce, has been granted to the United States. There has been, however, no such grant of power over the fisheries. These remain under the exclusive control of the State, which has consequently the right, in its discretion, to appropriate its tidewaters and their beds to be used by its people as a common for taking and cultivating fish, so far as it may be done without obstructing navigation.

Whether the United States could make laws for the protection of fish in navigable waters is not settled by these cases. In the *Manchester* v. *Massachusetts* case the court said:

> We do not consider the question whether or not Congress would have the right to control the menhaden fisheries which the statute of Massachusetts assumes to control; but we mean to say only that, as the right of control exists in the State in the absence of the affirmative action of Congress taking such control, the fact that Congress has never assumed the control of such fisheries is persuasive evidence that the right to control then remains in the State.

The Supreme Court of Iowa has held that its fish laws extend from bank to bank of the Mississippi. *State* v. *Moyers* (155 Iowa, 678 (1912)). The Supreme Court of Wisconsin, on the contrary, has held that the laws of Minnesota for the protection of fish, control only to the main channel of that river. *Roberts* v. *Fullerton* (117 Wis., 222

(1903)). Whatever rule may finally prevail as to the right of a State to enforce its fish laws beyond the State line in rivers subject to concurrent jurisdiction, there is no conflict as to its right to enforce these laws on that part of the river within its own boundary.

It is clear from these decisions that, in the absence of legislation by Congress, the States have a complete right to provide fish protective legislation for navigable waters. But it is not to be concluded from this that the National Government is wholly uninterested. The central authority is concerned with any question which affects the general welfare, and the food supply is certainly of this character. The United States Government is, moreover, specifically concerned with fishery resources for the reason that the Bureau of Fisheries plants millions of fishes and mussels in the waters of the different States. Because of this interest the Bureau endeavors to assist in the task of securing both adequate development of aquatic products and their effective protection.

As a war measure the Food Administration has licensed and regulated salt-water fishermen; but the State laws not in conflict with these regulations remained in effect.

II. NAMES OF FISHES.

As the same species or genus is given different names in different statutes, and even in the same statute, the names by which the fishes will be distinguished herein are listed, together with cross references from other names that are in common use or are found in the statutes. When a genus includes more than one species, all the species are often, perhaps usually, included under one English name, so that such names are commonly generic rather than specific, at least on the Mississippi River. Because of the infinite confusion in the use of these popular names it can not always be determined with certainty to what species or genus a statute refers. Care has been taken to be as accurate as possible under these circumstances.

Alewife. *Pomolobus* Rafinesque, all American species.
Barfish. See Bass, striped.
Bass. Sometimes means black bass and striped bass, and sometimes appears to include other species also.
Bass, black. *Micropterus* Lacépède, both species.
Bass, calico. See Crappie.
Bass, gray. See Bass, black.
Bass, green. See Bass, black.
Bass, largemouth. *Micropterus salmoides* (Lacépède). See Bass, black.
Bass, Oswego. See Bass, black.
Bass, rock. *Amblophites rupestris* (Rafinesque), and probably *Chænobryttus gulosus* (Cuvier and Valenciennes).
Bass, silver. See Bass, striped; Crappie.
Bass, smallmouth. *Micropterus dolomieu* Lacépède. See Bass, black.
Bass, strawberry. See Crappie.
Bass, striped. *Roccus chrysops* (Rafinesque) and *Morone interrupta* Gill.
Bass, white. See Bass, striped; Crappie.
Bass, willow. See Bass, black.
Bass, yellow. See Bass, striped; also Bass, black.
Billfish. See Gar.
Black-fin. See Cisco.
Bluegill. See Sunfish.
Bowfin. *Amiatus calvus* (Linnæus).
Buffalofish. *Ictiobus* Rafinesque, all species, and probably *Carpiodes* Rafinesque, all species.
Bullhead. *Ameiurus* Rafinesque, all species, doubtless excepting *lacustris* (Walbaum), if there be such a species.
Burbot. *Lota maculosa* (Le Sueur).
Carp. *Cyprinus carpio* Linnæus, and probably (but not in Illinois) *Carpiodes* Rafinesque, all species.
Carp. German. See Carp.
Cat, shovel-nose. See Paddlefish.
Cat, spoonbill. See Paddlefish.
Catfish. *Ictalurus* Rafinesque, all species; *Leptops olivaris* (Rafinesque); and in some cases all species of *Ameiurus*, the bullheads.
Catfish, stone. *Noturus* Rafinesque and *Schilbeodes* Bleeker, all species.

Char. See Trout.
Chub. See Minnow. The "chub" of Illinois (Lake Michigan) is herein called cisco.
Cisco. *Leucichthys* Dybowski, or *Argyrosomus* Agassiz, all species. See also Tullibee.
Crappie. *Pomoxis* Rafinesque, both species.
Dace. See Minnow.
Dogfish. See Bowfin.
Drum, fresh-water. *Aplodinotus grunniens* Rafinesque.
Eel. *Anguilla rostrata* (Le Sueur).
Eel-pout. See Burbot.
Fallfish. *Semotilus bullaris* Rafinesque (in Pennsylvania). The species is more generally known as chub; it is in the minnow family.
Gar. *Lepisosteus* Lacépède, all species.
Gaspergou. See Drum, fresh-water.
Goggle-eye. See Bass, rock.
Grayling. *Thymallus* Cuvier, all species.
Grinnel (Grindle). See Bowfin.
Hackleback. See Sturgeon.
Herring. See Alewife; also Cisco.
Herring, lake. See Cisco.
Jackfish. See Perch, pike.
Killifish. *Fundulus* Lacépède, all species, and possibly other species of the family Pœciliidæ.
Lawyer. See Burbot; also Bowfin.
Longjaw. See Cisco.
Minnow. Cyprinidæ, except *Cyprinus carpio* Linnæus, the carp. The word "minnow" is sometimes used loosely for all small fishes except game fish.
Mullet. See Redhorse.
Muskellunge. *Esox masquinongy* Mitchill.
Paddlefish. *Polyodon spathula* (Walbaum).
Perch. As used in Louisiana this name appears to mean sunfish and rock bass.
Perch, black. See Bass, rock.
Perch, lake. See Perch, yellow.
Perch, pike. *Stizostedion* Rafinesque, both species.
Perch, ring. See Perch, yellow.
Perch, silver. Undetermined (West Virginia).
Perch, white. See Drum, fresh-water; also Crappie.
Perch, yellow. *Perca flavescens* (Mitchill).
Pickerel. *Esox* Linnæus, all species except *masquinongy*, the muskellunge.
Pike. See Pickerel. The "pike" of Wisconsin and Iowa is herein called pike perch.
Pike, blue. See Perch, pike.
Pike, grass. See Pickerel.
Pike, sand. See Perch, pike.
Pike, wall-eyed. See Perch, pike.
Pike, western. See Muskellunge.
Quillback. *Carpiodes* Rafinesque, all species. In some States it may be intended to include these under the terms carp or buffalofish.
Red-eye. See Bass, rock.
Redhorse. *Moxostoma* Rafinesque, all species, and *Placopharynx duquesnii* (Le Sueur).
Rock. See Bass, striped.
Sac-a-lait. See Crappie.
Salmon. Usually means landlocked salmon, but may also include pike perch in some cases.
Salmon, jack. See Perch, pike.
Salmon, landlocked. *Salmo sebago* Girard.
Salmon, Susquehanna. See Perch, pike.
Salmon, wall-eye. See Perch, pike.
Salmon, white. See Perch, pike.
Salmon, yellow. See Perch, pike.
Sauger. *Stizostedion canadense* (Smith). See Perch, pike.
Shad. *Alosa sapidissima* (Wilson).
Shad, gizzard. *Dorosoma cepedianum* (Le Sueur).
Shad, hickory. See Shad, gizzard.
Sheepshead. See Drum, fresh-water.
Spoonbill. See Paddlefish.
Sturgeon. Acipenseridæ, and possibly in some States *Polyodon spathula* (Walbaum), the paddlefish.
Sucker. Catosomidæ, except, usually or always, the genera *Ictiobus, Carpiodes, Moxostoma*, and *Placopharynx*.
Sunfish. *Lepomis* Rafinesque, all species.
Trelipie. See Tullibee.
Trout. *Salvelinus* (Nilsson) Richardson, all species except *Salvelinus namaycush* (Walbaum), the lake trout, and its subspecies; also *Salmo* (Artedi) Linnæus, all species of the region except *Salmo sebago* Girard, the landlocked salmon. See also Trout, lake. In the South black bass are sometimes called trout.
Trout, brook. *Salvelinus fontinalis* (Mitchill). See Trout.
Trout, brown. See Trout.
Trout, green. See bass, black.
Trout, lake. *Cristivomer*, or *Salvelinus namaycush* (Walbaum).
Trout, rainbow. See Trout.
Trout, salmon. Name used on Great Lakes for Trout, lake.
Tullibee. *Leucichthys tullibee* (Richardson), and probably other species of the same genus; name used in Minnesota. See also Cisco.
Wall-eye. *Stizostedion vitreum* (Mitchill). See Perch, pike.
Whitefish. *Coregonus* (Artedi) Linnæus, all species.

III. TIME, PLACE, AND MANNER, OF CAPTURE.

Arkansas.—Bag limit on "trout," black bass, striped bass, rock bass, and crappie is 25 fish (55). Explosives and drugs shall not be used to take or injure fish (45, 46). Shooting fish is forbidden (47). Nets may be used only as follows: Hoop nets without wings, or with wings not over 50 feet long, the mesh of net and wings to be at least 3 inches square; a minnow seine not exceeding 16 feet in length used by a person licensed to fish with artificial bait; a seine not more than 60 feet long with mesh at least 1½ inches square, used by picnic parties to catch fish for their own use, June 15 to September 1 (49). The fish and game commission may issue permits for taking with nets fish for distribution and propagation in the State (50). Except with line and not over three hooks, fish shall not be taken during the spawning season; until otherwise determined by the commission this is declared to be March 15 to May 15 (48, 53, 54). It is unlawful to take fish from an inclosed or artificial pond which has been posted by the owner. (Act approved Feb. 16, 1875.)

Illinois.—No fish may be taken within 100 feet of any dam (25). A seine not over 20 feet long with mesh not less than ¼ of an inch square may be used to take minnows for bait only (37). Hoop, fyke, dip nets, or baskets with mesh not less than 1½ inches square, may be used July 1 to April 15 and seine with same mesh September 1 to April 15, except for black bass, pickerel, pike perch, whitefish, trout, cisco, and yellow perch (35). Gill and pound nets with mesh not less than 2¼ inches square may be used for whitefish and lake trout December 1 to November 1 (36). Gill, dip, and pound nets with mesh not less than 1¼ inches square may be used for cisco, or with mesh not less than $1\frac{1}{16}$ inches square for yellow perch, provided not over 10 per cent of catch at any lift consists of lake trout of a less weight than 1½ pounds dressed each, and such lake trout may be sold only locally and not shipped (36). Maximum lengths for nets are: Hoop, fyke, or pound 200 yards and seine 1,000 yards; they shall not obstruct more than half the width of a watercourse (39).

The commission may set aside fish preserves in which fishing with other devices than hooks and lines, or minnow seine for bait, may be practiced only by special permit (25, 37).

Drugs, explosives, firearms, artificial lights, snare spears, gig graines, and trammel nets shall not be used to catch fish (40, 40b).

It is unlawful to fish in private ponds without the owner's consent (40b).

Persons authorized by the United States may take fish for propagation or distribution and may destroy gizzard shad and gar; the University of Illinois and its agents may take fish for scientific purposes (38, 51).

Mussel fishing may be practiced commercially with one boat only or an additional boat for towing, and with only two crowfoot bars not over 16 feet long each, and only one dredge not over 3 feet long; such fishing is permitted from only April 15 to November 30 (55). The commission may close areas to mussel fishing for periods not exceeding five years (57).

Frogs over one-fourth pound shall not be taken in May or June (34).

Structures excluding daylight or used for concealment in ice fishing are prohibited (40a).

Indiana.—Shallow waters designated by the commissioner of fisheries as breeding grounds shall not be fished between March 20 and July 1 (2533a). Closed season for trout (except in boundary waters) is September 1 to April 1, and trout waters (except boundary waters) may be closed for three years by the commission. (1917, ch. 42.) Bag limits (not applicable to private ponds) are 50 sunfish or crappie, and 12 bass, or 20 bass in one boat (2543), or 20 trout, possibly excepting trout from boundary waters. (1917, ch. 42.) It is unlawful to fish in private ponds without the owner's permission, or to enter upon inclosed land for the purpose of setting a trot line (2549–2551).

In interior waters (and as to net, seine, or traps within 100 yards of Indiana tributaries to boundary rivers) the following kinds of tackle are prohibited: Trot line with hooks smaller than five-sixteenths of an inch from point to shank, hook and line attached to floating device, gig, spear, seine, net, or trap of any kind. (2533b, as amended by 1915, chs. 16 and 2541.) Exceptions are made in favor of owners of private ponds, and persons catching minnows for bait in minnow traps and minnow seines not more than 12 feet long, 4 feet deep, "and the meshes of which shall not be larger than one-fourth of an inch" (2532, 2541); but minnows may not be taken in State breeding grounds for trout. (1917, ch. 42.) Except in boundary waters trout may be caught by hook and line only. (1917, ch. 42.) Fish other than carp, gar, bowfin, and sucker shall not be shocked by electricity nor caught by unaided hand or gaff (2548a). Fish shall not be shot (2539), nor taken or injured by means of stupifying or poisonous substances (2541, 2547) or explosives (2548).

Fishing by other means than hook and line is prohibited on or near fish ladders (2534, 7446).

In Lake Michigan and its bays and harbors gill and pound nets may be used for taking whitefish, lake trout, yellow perch, cisco, and rough fish; complicated restrictions are made as to size of mesh; gill nets must have flags attached. (1917, ch. 40.)

Iowa.—Closed seasons are as follows: Salmon and trout between October 1 and April 15; bass, pike perch, crappie, pickerel, catfish, and other game fish between December 1 and May 15 (2); in interstate waters pike perch, bass, and crappie, March 31 to June 1, inclusive (13). Bag limits for interior waters are 40 of the species first named, and not over 20 of them shall be bass, pike perch, or pickerel (2, 10).

Fishing is prohibited in streams stocked with breeding trout over 2 years old within one year from the date of stocking, if notice be posted (2). In ice fishing on interior waters no structure for protection against the weather or means for creating artificial heat may be used (2, 10). Except as stated in the following paragraphs fishing is limited, in interior waters, to two lines with one hook each, or three united hooks used in trolling (2, 5, 10).

A seine not exceeding 5 yards in length with three-eighths inch mesh may be used for taking minnows for bait (4).

One trot line may be used, May 15 to December 1, in streams including the Big Sioux River and the boundary portion of the Des Moines River, but it shall not extend more than halfway across (2, 11). Spears may be used to take carp, sucker, redhorse, and buffalofish in waters on the bottom lands and islands of Mississippi River (2).

From certain lakes, buffalofish, carp, quillback, redhorse, suckers, and gar may be taken in nets under special permit and supervision of warden, but no seine shall be used December 1 to June 15 (9). Nets may be used by licensees in Mississippi and Missouri Rivers, and shall have mesh not less than 2½ inches stretch measure (2, 11). It is unlawful to net food fishes in interstate waters and not use them (14).

Tackle other than rod, line, and hook may not be used within 300 feet of a fishway or dam (2). Drugs, explosives, and electricity shall not be used to take fish (3).

Fish in private ponds may be taken by the owner by any means; other persons shall not take fish from such ponds without the consent of the owner (8).

Kentucky.—In boundary streams all fish except black bass may be taken in seines and hoop nets without wings, having mesh not less than 1½ inches square. In navigable streams improved with locks and dams the same may be done, but the mesh must be not less than 2 inches square. Nets shall not be used nearer than 200 yards from the mouth of any stream, nor from a lock or dam, and shall not be used above the last lock and dam, and shall not be used during May. (1918, ch. 67.)

Except as stated in the preceding paragraph and except in private ponds, it is forbidden to take fish by other means than lines and set lines (1, 2, 5), or dynamite or drugs (3), or to shoot fish (4), or to kill or stun fish by striking upon the rocks or ice (6). Minnows may be taken for bait (7). Entering without consent upon the lands of another for the purpose of fishing is unlawful (1252, 1259).

Louisiana.—Bag limit is 25 black bass, striped bass, or crappie, and 100 "perch" and sunfish (resolution of conservation commission, now department of conservation, adopted Sept. 10, 1912). Black bass, striped bass, crappie, "perch," and sunfish shall be caught only with line having not more than five sets of hooks or with trolling line and artificial bait (40). Seines may be used for taking minnows or shrimp for bait (33).

Hoop nets are prohibited in bayous, lagoons, and streams less than 40 yards wide and seining in fresh water is prohibited, except in certain waters for common species, such as buffalofish and catfish under permit by the department (33); letter of the president of the commission, now department, to Dr. H. M. Smith, United States Commissioner of Fisheries, dated October 25, 1915, includes paddlefish and "gaspergou" (fresh-water drum) as such common species. Seines shall not be used within 100 feet of the shore and shall not exceed 900 feet in length; splashing of water or pounding of boat to drive fish into seine is not permitted; vegetation hauled out with seine must be returned to the water; gars taken in seine must be killed. (Rules on permits issued by department pursuant to sec. 42.) Permits may be revoked if shown to be detrimental to game and fish resources (33). Hoop nets must be made of twine and be at least 3-inch mesh on bar between knots (64). Seine, hoop net, or set line shall not be used for buffalofish between February 15 and April 15, nor for paddlefish between January 1 and July 15, nor for catfish between May 15 and July 15; no paddlefish shall be had in possession which does not contain roe suitable to be made into caviar (37). Puddling water to catch fish and using lights, fyke, gill, or trammel nets or other permanent set means are prohibited (44, 45, 55); hoop nets are probably not intended to be included in this prohibition, for they are regulated as hereinbefore noted. Explosives and drugs shall not be put into public waters (57).

The department may prohibit the taking of any kind of fresh-water fish in any part of the State for not over three years (52).

The department may grant written permits to take fish for the purposes of science, cultivation, or distribution (47).

The department may adopt regulations for the protection and propagation of frogs and alligators; and fix the season during which and the size at which they may be taken or sold; but such regulations shall not prevent the killing of alligators found damaging levees or canals. (1918, house bills Nos. 118 and 120.)

Diamond-back terrapin, unless artificially propagated, shall not be taken between April 15 and June 15 (60, 61). Nest or eggs of terrapin must not be molested. (1910, act 50.)

Salt-water operations for fish, shrimp, and oysters are regulated by several acts.

Minnesota.—Closed season for trout or salmon, except lake trout caught in international waters, is September 1 to May 1 in northern part of State, and September 1 to April 15 in southern part; for black bass, March 1 to June 15 in northern part of State, and March 1 to May 29 in southern part; other varieties of fish March 1 to May 1 (4807). In interstate waters the closed season for black bass is the same, and for other game fish it is March 1 to May 1 (4830).

Bag limits are 25 crappie or trout, 15 pike perch, 15 bass, except rock bass, and no person shall have in possession more than 25 bass, except rock bass (4808), and the taking of over 25 fish in one day is prohibited, with exceptions (4896). Crappie, trout, pike perch, and bass (except rock bass) shall be taken only with hook and line, and not more than one line shall be used, and it shall have not more than one bait, except that three artificial flies may be used in trout fishing (4808). Provision is made for closing trout streams to all fishing except during season for trout (4857–4859). And there are provisions for the more thickly populated localities (4885–4895).

Fishing in a lake or stream within 50 feet of a fishway is forbidden (4864).

Fishing on Sundays is unlawful. (Gen. Stat. of 1913, sec. 8753.)

Fishing in certain waters by means of set lines (4835, 1917, ch. 333, sec. 4), fish house (4866, 1917, ch. 96, sec. 10), and tip-ups (4867–4868) is regulated. Spears may be used for specified food fish, subject to numerous restrictions (4808).

Netting in inland lakes for whitefish and tullibee for domestic use is permitted with numerous restrictions (4808), likewise gill netting for herring for domestic use and not for sale. (1917, ch. 176.) The taking of fish from shallow waters is provided for. (1917, ch. 84.) The game and fish commissioner may catch and sell specified rough fish where it appears that they are detrimental to game fish. (1913, ch. 477.) In the Mississippi River within the State (from Falls of St. Anthony to 1,000 feet above the mouth of the St. Croix River) pound net, seine, or dip nets may be used to take sturgeon, redhorse, bowfin, buffalofish, catfish, pickerel, carp, and suckers, as follows: Not within 1,000 feet of mouth of a stream; pound net not over 75 feet long; seine not over 150 feet long; mesh in all cases not less than 2½ inches on bar (4819). Netting in certain waters is allowed for specified rough fish, under supervision of warden and subject to exceptions and to provisions as to mesh, bond, and reports, except for most waters, April 1 to October 1. (1915, chs. 261 and 318; and 1917, ch. 386.)

In international waters nets and set lines may be used by United States citizens resident in Minnesota, under restrictions as to size, mesh, number of nets, leads, position, and seasons. (1917, chs. 96 and 333.)

In the St. Croix River and the interstate portion of the Mississippi River, fish, except catfish under 15 inches rough, 12 inches dressed, pike perch, pickerel, bass, sunfish, yellow perch, and crappie, may be taken by residents of Minnesota and, provisionally, of Wisconsin (4845) with nets, set lines, and spears, except April 15 to June 15 (4826-4835); no license is required for spearing (4833); the mesh is limited for each kind of net and for different parts of the same kind (4834); set lines may have not more than 300 hooks, shall not be baited with live bait, and no person may have more than one (4835); nets must bear license number above water; and seines shall not be longer than 4,000 feet and shall not be raised at night (4840); fyke nets must be raised at least weekly (4841).

Drugs or explosives shall not be used to take fish (4865).

The accredited representative of any incorporated society of natural history or college may collect fish for scientific purposes under permit of the game and fish commissioner (4771).

Mussel fishing may be practiced commercially with one boat only, or an additional boat for towing, and with only two crowfoot bars not over 20 feet long each, and only one dredge not over 3 feet long with prongs or forks nor more than 4 inches long, and it is lawful to use a pitchfork; the commission may close areas to mussel fishing for periods not exceeding five years. (1917, ch. 471.)

Commission may prescribe a "closed season" permanently or for a number of years for frogs (and game birds and animals protected by law) in certain districts. (1915, ch. 288.)

Mississippi.—Boards of supervisors have authority to regulate the time and the places in which and the circumstances under which fish may be taken (4700–4703); they may entirely prohibit the catching of fish for one or more years or seasons when they believe that the supply is about to be exhausted (4704); they may prohibit the use of seines, barrel nets, gill nets, and other like contrivances, or any of them, or may restrict the use of the same to places which annually go dry, and may prohibit or regulate the use of the same in particular waters, and may prescribe what kinds of seines or nets may be used and when and where (4707). The use of fish traps may be prohibited or regulated by boards, and every fish trap which wholly obstructs the passage of fish shall be unlawful (4708). Fish shall not be taken by means of explosives (902), and shall not be poisoned (1062). Fishing on Sunday (1105) or on the premises where the owner has posted a notice forbidding it is unlawful (1135).

Missouri.—Gigging and spearing are prohibited from December to April, inclusive; all fishing except hook and line and gigging are prohibited during April and May; not more than 50 pounds of fish, in addition to one individual fish, shall be gigged or speared in one day, and that for domestic use only (6548). Fishing through ice is prohibited (6549).

A glass or wire minnow trap, or a seine not more than 20 feet long and 4 feet wide may be used to take minnows and small sunfish for bait; residents may net fish for food, but not for commerce, from temporary overflows; the owner of the land, or other person by his permission, may use a 2-inch-mesh seine to take fish from unnavigable streams during July, August, and September, for consumption, but not for sale; bowfin, paddlefish, and gars may be taken at any time and in any manner, except by explosives (6548).

Seines, trammel, and hoop nets with mesh at least 2 inches square may be used in the Mississippi and Missouri Rivers from June to March, inclusive, but not within 300 yards of the mouth of any stream or slough. With the exceptions just stated, and excepting also fish taken in private pond or reservoir wholly upon the premises of the owner or occupant and by his consent, it is unlawful to take fish by any means other than hook and line, gig, spear, trot line, or artificial bait (6548). Fishing devices shall not obstruct the free passage of fish through watercourses (6535). Within 200 feet of a fishway fish may be taken only by means of pole, line, single hook, and natural bait (6549).

Fish shall not be taken by means of explosives or drugs (6537, 6538).

Under permit by the game and fish commissioner fish may be taken for scientific or propagating purposes (6568).

Pearl fishing is prohibited from March to June, inclusive (6551).

Ohio.—For black bass the closed season in inland district is the month of May, and in Lake Erie district May 25 to July 15, inclusive (1428). Trout and salmon may be caught only from April 15 to September 15, inclusive (1431). Bag limits are 12 black bass or 40 sunfish; black bass, crappie, and rock bass may be taken only with hook and line (1428). Trespassing on a private fishery is unlawful. (1912, Gen. Code, secs. 10174 and 12525.) Fishing on Sunday is forbidden. (1912, Gen. Code, sec. 13048.) Fishing in inland district is permitted only with hook and line, and in streams, by the owner of the adjoining land or under his consent, with trot line, bob line, or spear (1426). Ice fishing in inland district is permitted only through two holes not more than 2½ feet each in diameter; not more than two hooks shall be used on one line (1427). Minnows may be taken only for bait; in inland waters they may be caught with a seine not exceeding 4 feet by 8 feet, and in the Lake Erie district by a seine not exceeding 30 feet in length (1433). Explosives, poisonous substances, and electricity shall not be used to take fish (1446).

Fish in pools left by receding waters may be taken in any manner (1456).

Closed season for netting in the Lake Erie district is December 16 to March 14, inclusive (1434, 1442). In this district the following kinds of tackle may be used: Pound, gill, fyke, trap, and devil net, seine, trot line, and hook and line limited to three hooks; no fish shall be driven into any net by noise or other disturbance (1438). The mesh of gill nets shall not be less than 3 inches, stretched factory measure; pound and fyke nets shall have a specified portion with not less than 2¾-inch mesh, and that portion shall not be puckered (1441). Netting is prohibited in parts of the district (1439, 1440, 1450, 1452). Carp may be taken at any time in waters connected with Lake Erie by a seine having mesh not less than 4 inches stretch, or by other nets authorized by the secretary of agriculture (1453).

Turtles may be netted only with "single seine or net" with mesh 4 inches square (1432).

Pennsylvania.—Closed seasons on fish are as follows: Trout, August 1 to April 14, inclusive; lake trout, September 30 to June 30, inclusive; black bass, rock bass, striped bass (fresh-water), crappie, pike perch, pickerel, muskellunge, and yellow perch, December 31 to June 30 (15). In boundary lakes the closed season on black bass.

rock bass, crappie, muskellunge, and pickerel is November 1 to May 20, inclusive. (1913, act 71, sec. 4.) Bag limits are 25 trout; 25 striped bass, rock bass, and crappie; 12 black bass; 25 pike perch; 25 pickerel; 4 muskellunge; 50 yellow perch; 50 sunfish (35). In boundary lakes the limits are 25 rock bass or crappie and 12 black bass, muskellunge, or pickerel. (1913, act 71, sec. 4.)

Only a single rod and line, or one hand line with not more than three hooks, may be used to take trout, pike perch, pickerel, muskellunge, fall fish, black bass, crappie, striped bass (fresh-water), and rock bass; other fish may be taken only by rods and lines or one hand line with not more than three hooks attached, all to be under the immediate control of the person using them (4, 6, 45).

Minnows, killifishes, and stone catfish may be taken in dip net or minnow seine not over 4 feet in diameter, or a minnow trap with not more than one opening, which shall not exceed 1 inch in diameter (5, 45).

The commissioner may promulgate rules for catching fish (121), and may set aside small streams and lakes as nurseries, and, after publishing and posting notice, prohibit fishing therein (124).

Sunday fishing is prohibited (10). Within 100 feet of the lower end of any fishway or dam, or within any other distance specified in a notice posted by the commissioner, only rod, hook, and line fishing is permitted (92).

Electricity, explosives, and poisonous substances shall not be used to take fish. (100; 1913, act 71, secs. 5 and 6.)

Fishing for scientific research, or propagation, or stocking may be carried on under permit from the commissioner (120).

In boundary lakes black bass, rock bass, crappie, muskellunge, and pickerel may be caught only with "rod and line having not more than three hooks, or with a hand line having not more than three hooks, or a spear used for catching carp and suckers only or with a trolling line with spoon hooks attached;" in bays or waters on any peninsula of boundary lakes any kind of fish may be taken only by means of rod and line or hand line, either to have not more than three hooks attached, or with a trolling line with spoon hooks attached; exceptions are made in favor of minnow nets. (1913, act 71, secs. 1–3.)

In boundary lakes, subject to the limitations just stated and at distances from bays, streams, and the shore varying for different kinds of nets, licensees may use gill nets with mesh at least 3 inches stretch measure and not more than 30 meshes deep, or if for lake trout with mesh at least 5½ inches stretch measure; also pound nets with crib having mesh at least 2½ inches stretch measure, trap nets with mesh at least 2½ inches stretch measure, and set lines called "night" lines. (1913, act 71, secs. 9 and 11, as amended by 1915, act 226.) Nets, except gill and pound nets, must be tagged (1913, act 71, sec. 15.).

Sturgeon fishing in Lake Erie shall be stopped for five years when the same provisions is made by Ontario, New York, and Ohio. (1917, act 32.)

For shad, alewife, catfish, suckers, eel, and carp, licensees may use from March 1 to June 20 in the Susquehanna River from McCall's Ferry Dam to the Maryland State line, and within the limits of tidewater, the following kinds of tackle: Haul seine or shore seine, dip net, or hold-in net, sometimes called a moon rake, "with diameter of not more than 3 feet at the widest point and a length of not more than 7 feet from heel of the bow, being the point of jointure of the sides of the bow at the handle." The mesh must be not less than 1¼ inches, knot to knot, while being fished (55–58).

Fishing on the Delaware River is regulated by special acts. (1889, act 240, and 1909, acts 201 and 269, and amendments.)

Fishing by unnaturalized foreign-born residents is forbidden. (1915, act 84.)

The closed season on bullfrogs and tadpoles is from November 1 to July 1, inclusive, and on terrapin from March 15 to November 1; limits on catches are 25 bullfrogs or tadpoles in a day, 50 bullfrogs in a season, 5 terrapin in a day, and 50 terrapin in a season; bullfrogs shall not be taken by the use of a light at night. (1917, act 180.)

Tennessee.—Closed season on trout, black bass, landlocked salmon, crappie, and rock bass is from May 1 to June 15 (47).

Trammel nets, baskets, dip nets, and set nets with mesh at least 2 inches in width may be used by licensees in Cumberland, Mississippi, Tennessee, Big Sandy, Obion, and Forked Deer Rivers, but not within 200 feet of any inlet nor within 300 feet of any lock or dam (49). With this exception, and also excepting the taking of fish from private ponds, and the seining of minnows for bait, fish shall not be captured by nets, traps, gun, gig, grabhook, poison, explosives, or any means other than rod and line and trot line (45). Minnows so taken must be under a length of 4½ inches, and the net must not be over 10 feet long (46).

West Virginia.—Closed season on pike perch, black bass, rock bass, pickerel, suckers, carp, and redhorse is April 1 to July 1, and on trout and landlocked salmon from August 1 to July 1 (42). Fishing on Sundays is prohibited (26). Small fishes,

except salmon, bass, shad, and trout may be taken for bait or scientific purposes by means of hand or cast nets (42). The only tackle permitted is hook and line and trot line having hooks not less than 2 feet apart, and hand or cast nets to take minnows for bait; other tackle may be used by the owner to take fish from private springs or ponds, and persons other than the owner shall not take fish from such waters (42). Drugs, explosives, and electricity shall not be used to take fish (46, 47). Fishing on lands of another person without permission is forbidden (48).

Wisconsin.—The conservation commission may determine, after petition and hearing, in what manner, in what numbers, in what places, and at what time wild animals (includes fish) may be taken (29.21).

Closed seasons (omitting provisions for special counties or bodies of water) are as follows, all dates being inclusive: Black bass from March 2 to June 14; "Oswego bass, green bass, and yellow bass," from March 2 to May 28 (as these names are popular synonyms for black bass it is impossible to know certainly what the closed season is, in this State, for black bass); yellow perch and sunfish in counties bordering on the Mississippi River, and rock bass, white bass, catfish, muskellunge, pike perch, and pickerel in the State generally, from March 2 to May 28; trout, from September 1 to April 30; sturgeon, all year (29.19). The season for hook and line fishing in the Mississippi River, except for black bass, opens May 1 (29.19).

Bag limits are 10 black bass, 30 rock bass, 35 trout, 10 pike perch, 15 pickerel, 2 muskellunge, 10 catfish, but no catfish limit on Mississippi River, 30 pounds of bullhead (29.19).

All fishing is prohibited in streams and creeks containing trout, during the close season for trout; or at any time in any spring hole or artificial well connected with any of the waters of the State; or by means of shutting or drawing off water for that purpose; or within 200 feet (more in some localities) of any fishway, lock, or dam except with hook and line (29.26).

Not more than three lines may be used, each having not more than two hooks or one spoon or artificial bait each. Spearing for rough fish is prohibited in unnavigable waters containing trout, in navigable waters containing trout, during the closed season for trout, also in certain specified waters, and at night time in inland waters. The use of snag line or snag pole is prohibited (29.27).

Fishing through ice is prohibited in certain waters; spearing of pickerel through the ice is permitted in the Mississippi River and its lakes, bays, bayous, and sloughs; fish shelters may be used on the Mississippi River and certain other waters (29.28).

Explosives, poisonous substances, and other substances deleterious to fish life, or which might attract fish in unusual numbers shall not be used for taking fish, except that cisco may be baited with oatmeal for the purpose of catching them with hook and line through the ice (29.29).

Minnow seines not over 40 feet long (100 feet in Great Lakes waters) and 5 feet deep, and dip nets not exceeding 6 feet in diameter, may be used for taking rough fish minnows for bait; but in trout streams they must be used only under the supervision of a deputy warden (29.32).

Net and set-line fishing is regulated as follows: No apron or other device to catch small fish shall be used in pound net; no net shall shut off more than one-half the channel or passageway of any stream, or be set within 1,000 feet of any other net; no licensee shall join his net to that of any other licensee; flags bearing the license number must be maintained over nets and lines; licensees in Great Lakes waters must permit State officials to accompany them and the officials may at any time raise set lines; except in specified Great Lakes waters, no net shall be drawn or lifted from one hour after sunset until sunrise; all rough fish taken in nets in inland waters shall be brought to shore and disposed of, but not returned to the water; sizes of nets specified mean the size, stretch measure, at the time of use (29.30).

Set lines may be used in certain waters with hooks not smaller than 5–0, and with not over 25 or 300 hooks, depending on locality (29.37).

Elaborate and complicated regulations are provided for net and set-line fishing in Great Lakes waters (29.33). Net fishing is prohibited in the Mississippi River and Lakes Pepin and St. Croix from April 16 to June 14, also at all times in specified waters, and for catfish under 15 inches rough, 12 inches dressed, pike perch, bass of any variety, crappie, sunfish, pickerel, sturgeon, and yellow perch; in said waters seines shall not exceed 4,000 feet, and mesh shall be not less than 5 inches on the wings or 4 inches in the center of the pot, the pot not exceeding 150 feet, and gill nets shall have mesh not less than 7 inches, and pound or hoop nets not less than 6 inches in the leaders, 5 inches in the hearts, or 3 inches in the hoops, and bait nets shall be used without leads, have mesh not less than 3 inches and front hoop not over 4 feet (29.34).

Dip netting is allowed in specified inland waters (29.31). Provision is made for netting whitefish and cisco in inland lakes (29.35) and for netting rough fish in Winnebago waters (29.36).

The commission is authorized to net from inland waters (with exceptions) rough fish found to be detrimental to game fish, and to dispose of them to the best interest of the State (29.62).

The commission may authorize the taking of fish for scientific purposes or propagation (29.17, 29.01, 29.51).

The operation of private hatcheries is provided for (29.50, 29.52).

Crawfish and crabs shall not be taken between March 1 and July 1, nor frogs from March 1 to May 1, except that frogs may be had in possession by a person in the business of propagating them, or when used for scientific purposes (29.20). Frogs shall not be taken from lands owned by another without his consent (sec. 4565dm).

Nonresident mussel fishermen may use one boat only. Mussels shall not be taken with a dredge (29.38).

IV. SIZE LIMITS FOR AQUATIC ANIMALS.

MINIMUM SIZES OF FISHES AND OTHER AQUATIC ANIMALS, WITH REFERENCES TO THE LAWS IN EACH STATE.

State and citation of statute.	Bass, black.	Bass, rock.	Bass, striped.	Buffalofish.	Bullhead.	Carp.	Catfish.	Crappie.	Drum (freshwater).	Muskellunge.	Perch, pike.	Perch, yellow.
	In.	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*
Arkansas,[a] sec. 21	11	.....	8	(a)	.....	(a)	(a)	8	(a)	.....	11	.....
Illinois,[b] secs. 41, 42, 42A, 56.	10	6	8	18	7	15	[b]13	8	10	.....	13	7
Indiana[c]	10	6	.....	.....	.....	.....	.....	6	.....	.....	12	.....
Iowa, interstate waters, [d] sec. 13	11	.....	8	15	.....	15	13	8	.....	.....	15	.....
Iowa, interior waters, sec. 2.	10	.....	10	.....	.....	.....	10	8	.....	.....	12	.....
Louisiana,[e] secs. 37, 40, 60	8	.....	8	12	.....	.....	12	.....	.....	.....	.....	.....
Minnesota[f]	9	.....	.....	.....	.....	.....	(f)	.....	.....	(f)	(f)	.....
Missouri, [g] sec. 6550	11	.....	8	.....	.....	.....	[g]13	8	10	.....	11	.....
Ohio, [h] secs. 1428, 1442	10	5	[h]10	[h]16	[h]9	[h]14	[h]15	5	.....	.....	[h]9	[h]9
Pennsylvania,[i] sec. 25	9	6	6	.....	.....	.....	.....	6	.....	24	12	6
Tennessee, sec. 50	7	6	.....	.....	.....	.....	.....	6	.....	.....	.....	.....
West Virginia,[j] sec. 42	8	.....	.....	.....	.....	.....	.....	.....	.....	.....	7	.....
Wisconsin, certain Great Lakes waters, secs. 29, 33	.....	.....	.....	.....	.....	12	15	.....	.....	.....	13	8
Wisconsin, State generally,[k] secs. 19, 29	10	6	7	.....	.....	.....	15	.....	.....	24	13	.....

[a] Measurements to be from end of nose to fork of tail. Limits on sale only, and do not apply to minnows used for bait. Limits given by weight are as follows: Blue or channel catfish and drum, 2 pounds; carp and buffalofish, 3 pounds.

[b] Fish measurements are taken for "the length of the entire fish from the extreme tip of the snout to the extreme end of the tail fin," and turtle and terrapin for the extreme ends of the upper shell. Restrictions do not apply to pole and line fishing. The limit on lake trout and whitefish is 1½ pounds, dressed. The catfish restriction is confined to "blue and channel catfish."

[c] Section 2542 and ch. 42 of 1917. The size limit on trout does not apply to boundary waters.

[d] A different size limit (in interstate waters) is set for the species of sturgeon, being 1 pound for the sand sturgeon, shovel-nose sturgeon, or hackleback *Scaphirhynchus platorhynchus* (Rafinesque), and 3 pounds for the rock sturgeon or lake sturgeon *Acipenser rubicundus* Le Sueur; the former would perhaps include the white sturgeon *Parascaphirhyncus albus* Forbes and Richardson. The restrictions as to interstate waters do not apply to hook and line or spear fishing.

[e] The terrapin restriction is only on the diamond-back. Size limits for salt-water species are fixed by other acts.

[f] Sections 4827 and 4873 and ch. 471 of 1917. Measurements are taken from tip of snout to fork of tail; a different size limit is set for the two species of pike perch, being 14 inches, or 1 pound dressed, for the wall-eye, and 10 inches for the sauger. The limit on lake trout and salmon from inland waters is 16 inches. Catfish under 15 inches tip to tip rough, or 12 inches dressed, shall not be taken in nets in interstate waters. The limits for international waters are: Sturgeon, 15 pounds dressed; lake trout, 2 pounds round, or undressed, and 1½ pounds dressed; whitefish, 16 inches; wall-eye, 14 inches, or 1 pound round; muskellunge, 30 inches; sauger, 10 inches. The language of the statute is not perfectly clear, but these restrictions seem to be limited to international waters. Mussels, except "pigtoes," shall not be taken smaller than 1¾ inches.

[g] Measurements are taken from end of nose to fork of tail. The restrictions are applicable only to fish sold. The catfish restriction is limited to "blue and channel catfish."

[h] Measurements are made from end of nose to longest tip of tail (1449). Restrictions on striped bass, buffalofish, bullhead, carp, catfish, "pike," yellow perch, sturgeon, and whitefish apply only to commercial fishing in the Lake Erie district, and even here it is lawful to retain 3 per cent, by weight, of undersized fish, or 10 per cent of "pike"; the whitefish limit is 1¾ pounds. Catfish and sturgeon shall not be brought ashore in such condition that the length can not be measured.

[i] The limit on sturgeon applies only to boundary lakes (1913, act 71, sec. 10).

[j] Measurements are taken from end of snout to center of fork of tail.

[k] Measurements are taken from tip of snout to tip of tail. The restrictions as to Great Lakes fish limit only licensees in those waters; any such licensee taking undersized fish shall bring them ashore and notify the conservation commission or its deputy and the latter shall dispose of them.

MINIMUM SIZES OF FISHES AND OTHER AQUATIC ANIMALS, WITH REFERENCES TO THE LAWS IN EACH STATE—Continued.

State and citation of statute.	Pickerel.	Salmon, land-locked.	Sturgeon.	Sucker.	Sunfish.	Trout.	Trout, lake.	Whitefish.	Mussels.	Turtle or terrapin.	Fishes, except yellow perch and bullhead.	Fishes other than specified.
	In.	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*
Arkansas, [a] sec. 21	11				6	8						
Illinois, [b] secs. 41, 42, 42A, 56	18				4		(*b*)	(*b*)	2			
Indiana [c]	12					[c]7						
Iowa, interstate waters, [d] sec. 13	18		(*d*)									
Iowa, interior waters, sec. 2	12					10						
Louisiana, [e] secs. 37, 40, 60										[e]5½		
Minnesota [f]		(*f*)	(*f*)				(*f*)	(*f*)	(*f*)		6	
Missouri, [g] sec. 6550	11				6	8						
Ohio, [h] secs. 1428, 1442			[h]48					(*h*)				
Pennsylvania, [i] sec. 25	12		[i]36			6						
Tennessee, sec. 50		7				7						
West Virginia, [j] sec. 42	10					6						
Wisconsin, certain Great Lakes waters, secs. 29, 33	16			10			12	13				7
Wisconsin, State generally, [k] secs. 19, 29	16					7						

For footnotes see page 16.

V. LICENSES REQUIRED AND FEES THEREFOR.

Arkansas.—Licenses are issued by the game and fish commission and by the circuit clerk of the State (10, 11); fees are payable to the State treasurer or circuit clerk of the county (23). The fee for a resident for fishing with artificial bait is $1.10; for a nonresident for fishing, $5, or for a single 15-day trip in the year (not including the right to take fish out of the State), $1.25 (17). Fishermen catching fish to sell must pay $25 if using hoop nets, $10 if using lines or set lines, and for each helper, $5 (19). Dealers must pay to the State treasurer one-sixteenth of a cent for each pound of fish purchased in the State, this amount to be collected but one time, and from the first dealer purchasing (20).

Illinois.—Licenses are issued by city, village, and county clerks (23). Fees for net fishing are as follows, the amounts in parentheses being for nonresidents: Each 100 yards of seine, $5 ($10); dip or fyke net, $1 ($2); hoop net, 50 cents ($2); basket or trap net, 50 cents (?); in operation of gill or pound nets, steam tug, $25 ($200), gasoline launch, $15 ($50), sail or row boat, $10 ($30) (22). Clerk's fee is 25 cents extra (23). Owners of property, their children and tenants, may do net fishing, without license, from waters wholly within their property and not connected with any open stream (22). Gill and pound nets shall be operated from only a boat, as listed hereinbefore (39). The fee for conducting a wholesale-fish business is $10.50 (24). The commercial mussel fishing fee is $1.25 for residents and $25.50 for nonresidents, plus in either case $25 if a dredge is used (55).

Indiana.—Resident licenses to fish (and hunt) are issued by the commissioner of fisheries, or his agents, in Marion County, and elsewhere by clerks of the circuit courts; the fee is $1; owners of farm lands, their children living with them, and tenants may fish upon their lands without license; any person may fish in the county in which he resides and adjacent counties without license; children under 18 and wives of licensees may fish without license (2529). Nonresident licenses to fish are issued by clerks of the circuit court of the counties, and the commissioner, and persons appointed by him for that purpose; the fee is $1; children under 18, wives of licensees, and persons having hunting licenses are not required to have licenses (9366a).

Licenses for netting in Lake Michigan are issued by the commissioner; the amounts range from $1 to $300, depending upon the kind of boat used, if any, and upon whether the fisherman is resident or nonresident. (1917, ch. 40.)

Iowa.—Nonresident licenses for males over 16 years old to fish are issued by county auditors; the fee is $2. (1917, ch. 168.)

Licenses for net fishing in the Mississippi and Missouri Rivers are issued by the State fish and game warden. The fees are as follows: Each 500 feet of seine, $10; pound net having more than 100 feet of lead on each side, $4; pound net with less lead, $1; each bait, dip, hoop, and fyke net, 50 cents; each 300 feet of trammel net used

for floating fishing, $5. Metal tags at 10 cents each are required to be used and nonresidents must give bond (11).

Kentucky.—Netting licenses are issued by the county clerks. The fees for residents are $1.25 for one net, and $1 for each additional net; for nonresidents the fees are doubled. (1918, house bill, 181.)

Louisiana.—Licenses are issued by the department of conservation. Fees for seines are as follows: Less than 300 feet, $25; 300 to 600 feet, $50; 600 to 900 feet, $100 (33). Fees for wholesale dealing in fresh-water fish are $5 to $150, depending on the amount of business and whether the dealer is a resident or nonresident (34, 35). Fees for vessels purchasing fresh-water fish to make a cargo are $5 to $40, depending on tonnage of boat (36). The resident fee for buying and selling diamond-back terrapin is $25, and for buying, selling, and shipping, $100; the fee for nonresident or unnaturalized foreign-born resident for buying, selling, or shipping is $200 (63).

The fees for salt-water operations are fixed by several acts.

Minnesota.—Nonresident pole and line licenses are issued by the county auditor (4880) and other licenses by the State game and fish commissioner and deputies (4881). Licenses of Wisconsin are accepted if it reciprocates. (4845 and ch. 471 of 1917.)

Fees for fish house (4866), tip-up license (4868), nonresident pole and line license if fisherman is over 21 years old (4879), and for netting in inland lakes for whitefish and tullibee (4808), or for herring (1917, ch. 176) are $1.

The fee for seine, pound, or dip nets in the Mississippi River within the State is $5 for each net (4819). In international waters the fees are based upon the vessel used in Lake Superior, and upon the tackle used in other lakes. (1917, chs. 96 and 333.) In interstate waters the fees are: For seine, $1 a hundred feet up to 500 feet, then $2 a hundred to 1,000 feet, then $3 a hundred to 1,500 feet, then $4 a hundred to 2,000 feet, then $5 a hundred to 2,500 feet, then $6 a hundred to 4,000 feet; for gill nets, $5 for 2,000 feet, and $5 for each additional thousand; for pound net with leader not exceeding 700 feet, $5, and for each pound net in excess of one used with one leader, $5; each fyke or hoop net, $5; each bait or turtle net or set line, $1; metal tags are 25 cents each (4836). Fee for inland commercial fishing is 10 per cent or more of gross receipts plus expenses and compensation of warden. (1917, ch. 386.)

The commercial mussel-fishing fee is $5 for residents and $50 for nonresidents, plus in either case $25 if a dredge is used. (1917, ch. 471.)

Ohio.—Licenses are required for fishing with devices other than hook and line in the Lake Erie district, and are issued by the secretary of agriculture (1435). The fees for fishing with gill nets are as follows: Rowboat, $4; sailboat, $6; gasoline boat, $12.50; and steamboat, $20. The fee for fishing trot lines is $1.50 for each rowboat; for each seine, $4; for each pound net, $3; and for each device of any other kind, $1.50 (1436). Metal tags must be used on devices other than gill net and hook and line, but are issued without charge (1438).

Pennsylvania.—Licenses are issued by the department of fisheries. The fee for using a net in the lower Susquehanna or in tide waters is $2 (55). The fee for artificial propagation is $10 (70). Fees for fishing in boundary lakes are as follows: For row or sail boat used in fishing with gill net, $5; other boat under 10 tons gross burden so used, $10, of 10 to 20 tons $15, of over 20 tons $20; for each pound net, $10; for other net or device (except lines having not more than 3 hooks, a spear for taking carp and suckers and trolling spoons) 50 cents to $5 as determined by the department. (1915, act 226.) Licenses for boundary waters shall not be issued to residents of a State or county (country?) whose laws prohibit the issuance of a license to residents of Pennsylvania. (1913, act 71, sec. 14.)

Tennessee.—Licenses are issued by clerks of the county courts; the fee is $2 for each net or basket (49).

West Virginia.—Licenses for foreigners and nonresidents (angling and trot lining) are issued by county clerks; the fee is $5, but no license is required from nonresident owners or their children for fishing on their own land (42).

Wisconsin.—Licenses are issued by the State conservation commission, through agents in the case of hook and line licenses and through the county clerks in other cases (29.09, 29.15). Fishing licenses of Minnesota and Iowa are accepted if those States reciprocate (29.16). Licenses are issued only to persons (29.09).

Fees for nonresidents are as follows: Mussel fishing, $50 (29.38); hook and line fishing in inland waters for male fisherman over 16 years old, $1 (29.14); operating gill net in Great Lakes waters with steam vessel having steam lifter, $200, or, without steam lifter, $100, or with any other vessel not propelled by oars, paddle, or pole, $50, or a boat so propelled, $2 (29.33).

Fees for residents or nonresidents in Great Lakes waters are as follows: Gill net or nets, or each pound net and leader (except as noted for nonresidents), $2; trap, fyke, drop net, or nets with leaders, or each seine, $5; each trammel net or set hooks, $1 (29.33).

Fees for fishing in the Mississippi River and Lakes Pepin and St. Croix are as follows: Seines for first 500 feet, $1 a hundred, second 500 feet, $2 a hundred, third at $3, fourth at $4, fifth at $5, and 2,500 to 4,000 feet at $6 a hundred; gill nets for first 2,000 feet, $5, and for each additional thousand feet $5; pound or hoop nets with 700-foot leader and one pound, $5, and for each additional pound $5; bait nets, $1 each. For these waters fishermen must give bonds (29.34).

Fees for netting whitefish and cisco in inland waters is 50 cents (29.35); for taking rough fish in Winnebago waters, $5 to $50 (29.36), for using set lines, $1 (29.37).

Metal tags are required for nets and set lines, a fee of 25 or 50 cents each being charged for most kinds of nets (29.33–29.37).

VI. SHIPPING AND SELLING FISHERY PRODUCTS.

Arkansas.—The transportation of game fish beyond the State is limited to one day's catch, and requires the filing of an affidavit with a notary, justice, or other authorized officer (58, 59). The game and fish commission may permit fish to be shipped from the State for propagation purposes (7), and may permit fish to be sold and exported if privately propagated (8).

Illinois.—Black bass shall not be sold nor, if taken within the State, pickerel or pike perch (41). These fish shall not be shipped, except not over 25 fish in one lot as baggage (43). Fish, except whitefish, lake trout, cisco, and yellow perch, shall not be shipped from April 20 to July 1, inclusive, nor frogs over a quarter of a pound from April 15 to July 1, inclusive (44). Shipments of fish must be marked to show contents and other facts (43, 45). Carriers are forbidden to receive from unlicensed dealers fish caught in the State (24).

Indiana.—The transportation beyond the State, or the sale of pickerel, pike perch, yellow perch, sunfish, black bass, rock bass, or other species of bass, is forbidden, unless taken from private ponds, and except that a person may carry beyond the State 24 fish caught by himself (2533c, 2535).

Iowa.—Game fish shall not be shipped from inland waters for the purpose of sale and any person shipping game fish must deliver to the carrier a sworn statement (2).

Louisiana.—Black bass, striped bass, crappie, and sunfish shall not be sold (38). All shipments of fish and shipments without the State of diamond-back terrapin must be marked to show contents and other facts (41, 62). Diamond-back terrapin artificially propagated may be sold, but not for food, during the closed season (61). Fish packed in the State must not be labeled as produced outside the State. (1906, act 112.)

Minnesota.—The sale or shipment of pike perch from stocked waters (4871), or of trout or salmon from inland waters, or of black bass (4870), or of fish caught in lakes in Hennepin, Ramsey, or St. Louis Counties (4876), is prohibited. The commission may prohibit the sale of crappie, yellow perch, or sunfish caught in stocked lakes (4877). Fish shall not be shipped beyond the State except specified rough fish and except not over 50 pounds taken by a nonresident for personal use; packages shall be marked to show contents and other facts. (4875, 1917, ch. 333.)

Mississippi.—Boards of supervisors have authority to regulate by whom and in what quantities and to what extent fish may be marketed (4701).

Ohio.—Black bass shall not be shipped out of the State or sold; rock bass, crappie, and sunfish shall not be sold (1429, 1430). Fish caught through ice shall not be sold (1427). "White bait" may be shipped out of the State only if alive; minnows may be sold only for bait (1433). Shipments of fish must be labeled (1444).

Pennsylvania.—The sale of trout or black bass, whether caught in the State or elsewhere, is forbidden (110).

West Virginia.—The sale or serving at licensed eating places of trout, salmon, pickerel, bass, and "silver perch" is prohibited, also the shipment out of the State of these species, or the commercial shipment within the State (20, 45).

Wisconsin.—Shipments of wild animals, including fish, must be marked to show the contents and other facts, and the consignor must be the owner and must deliver to the carrier a statement that he is (29.34, 29.36, 29.43). The shipment of living young carp or bowfin is forbidden, and complicated regulations are made for the shipment of game fish (29.47). Transportation of fish into this State is forbidden if made from another State in violation of its laws (29.44).

The sale of black bass, muskellunge, or trout is forbidden, also the sale of any other game fish taken from public inland waters during the period extending from the 1st day of January to the next succeeding 29th day of May (29.48). Game fish taken from public inland waters from January 1 to May 29 and trout shall not be served at eating places, nor frog during the closed season (29.49).

VII. DEFINITIONS AND MISCELLANEOUS PROVISIONS.

Arkansas.—The term "waters" is defined to include those wholly or partly within the State (56). Milldam owners must provide a fish chute, and owners of other obstructions must make an opening to allow the passage of fish from March 1 to June 1. (1899, act 188.)

Dealers must keep records of their transactions (20); they have five days after the end of the open season in which to dispose of fish (48). The game and fish commission may regulate private propagation (8).

Illinois.—"Objectionable" fish is defined to mean gar and gizzard shad (51). Dam owners shall erect and maintain fishways (49). Licensees to take mussels must report annually (58).

Indiana.—Private pond is defined to include any body of water not greater than 20 acres in area lying wholly within the land of the owner (2533c). Except dams, obstructions to fish movements shall not be placed across streams (2544, 2545). Owners of dams 4 feet or more high must construct and maintain fishways as directed by the commissioner of fisheries (7442–7449).

Iowa.—"Game" fish is defined by the department of fish and game to include any food fish that takes a live bait. Cities and towns may prevent the escape of fish from boundary lakes (17). Dams or obstructions shall not be erected or maintained without a fishway constructed according to plans furnished by the State warden; nor shall pumping stations, other than sand pumps or dredging machines, be operated without guard screens constructed according to plans so furnished (16).

Kentucky.—Dam owners must maintain fish ladders during April, May and June, except where the "annual tides" are sufficiently high to admit the passage of fish over the dams (1392a).

Louisiana.—Intake pipes for irrigation must be screened to prevent the entrance of fish, except on the Mississippi River (56). No person shall obstruct by means of rack, screen, or other device the passage of fish protected by law (53).

Fish may be had in possession five days after the end of the open season (39). Dealers must report to the department (35, 36). The department may adopt regulations for the comprehensive control of fish, and shall assist in protecting private ponds (1912, act 127, sec. 2); it may prescribe regulations for stocked streams (51) and may regulate seines, hoop nets, and set lines (42). No spawn, fish, reptile, or amphibian except turtles from without the State shall be liberated without permission from the department. (50; 1918, house bill 120.)

Game and fish preserves are established. (1910, act 273, and 1912, act 172.)

Minnesota.—Persons owning or controlling dams or other obstructions must construct and maintain fishways (4772). Counties may screen navigable lakes that have been stocked by the United States. (1913, ch. 87.) For the purpose of commercial trout culture the game and fish commission may authorize the maintenance of fish screens (4861).

It is unlawful to have fish in possession if unlawfully taken without the State (4785). Fish taken in international waters may be retained one week after the end of the fishing season. (1917, chs. 96 and 333.)

Reports must be made to the commission by fishermen netting in international waters (1917, ch. 96), clammers (1917, ch. 471), and seiners in certain waters (1915, ch. 261).

Obstructing seiners is prohibited. (1917, ch. 452.)

Chapter 505 of 1917 provides for warden supervision of net fishing in interstate waters, but does not go into effect until a similar act is passed by Wisconsin.

Missouri.—Fish may be had in possession five days after the end of the open season (6522). Persons owning or using dams shall construct fish ladders as prescribed by the game and fish commissioner, and shall keep them open March, April, May, and June if there is waste water available (6552).

Ohio.—Lake Erie and inland fishing districts are respectively defined (1425).

On petition of 500 or more freeholders the county commissioners shall erect or maintain fishways over dams; on State dams this shall be done by the board of public works. (1910, Gen. Code, sec. 2496.) Except in Lake Erie, wardens may remove obstructions other than milldams (1448).

Private ponds are excepted from the restrictions on the manner of capture (1456).

Fishermen must allow State spawn takers on board and permit the taking of spawn (1455). Licensees must make annual reports (1437–1).

Except shad, mackerel, and herring, all fish sold in barrels or casks must be inspected and branded; regulations are made as to size of barrel and other matters (5987, 6010–6019). Possibly these regulations relate to preserved fish only.

Pennsylvania.—"Game" fish, "bait" fish and "food" fish are defined. (4–6; 1913, act 71, sec. 1.) Trout and black bass may be retained in possession six days after the end of the open season (17). When required by the board of fishery commissioners dam owners shall erect and maintain fishways (85–90). Dam owners must not strand fish (91). When required by the commissioners proprietors must install a bar rack to exclude fish from water wheels, pumps or canals (93–94). No person shall place obstructions to the passage of fish (95).

Artificial propagation is regulated (19, 28, 38, 48, 62, 70–81, 114). Dealers may be required by the commissioner to make reports (112). Representatives of the State must be permitted to accompany licensees on boundary lakes for the purpose of taking spawn. (1915, act 226.) Fish from boundary lakes shall not be used for fertilizer without the consent of the department of fisheries. (1913, act 71, sec. 8.)

Tennessee.—Obstructions shall not be placed in streams for the purpose of capturing fish (48). Certain counties are excepted from the operation of the general law, and special provisions of various sorts are made for more than half the counties of the State, as well as for Reelfoot Lake and the Appalachian Game Preserve. County courts may provide for fish traps. (Thompson's Shannon's Code, 1918, sec. 1721.)

West Virginia.—Owners of dams and other obstructions must build and maintain fishways in a manner satisfactory to the State warden (43). Fish may be had in possession 20 days after the end of the open season (20).

Wisconsin.—Great Lakes waters are defined as "outlying" and all other waters as "inland" (29.01). Until the conservation commission otherwise determines, rough fish are: Minnows, suckers, carp, redhorse, drum, burbot, bowfin, gar, buffalofish, and, in certain waters, pickerel; game fish are all other kinds (29.01).

Screens set in public waters to prevent the free passage of fish, or set in streams stocked by the State, are declared to be nuisances (29.03). Old and abandoned dams may be removed, and dams on State land may be repaired by the commission (29.04).

Licensees for the Mississippi River and Winnebago waters are permitted to retain fish in temporary ponds (29.34, 29.36). Reports are required from licensees for the Great Lakes and the Mississippi River (29.33, 29.34).

HABITS OF THE BLACK CRAPPIE IN INLAND LAKES OF WISCONSIN

By A. S. Pearse
University of Wisconsin

Appendix III to the Report of the U. S. Commissioner of Fisheries for 1918

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HABITS OF THE BLACK CRAPPIE[a] IN INLAND LAKES OF WISCONSIN.

By A. S. Pearse,
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I. INTRODUCTION.

The black crappie, *Pomoxis sparoides* (Lacépède), is particularly common in the Great Lakes region and the upper Mississippi Valley, and ranges from the Lake of the Woods and Ottawa south to Texas and east to New Jersey. It was selected for careful investigation on account of its ability to thrive in shallow, dirty water, which is subject to wide variations in temperature. Such qualities make the

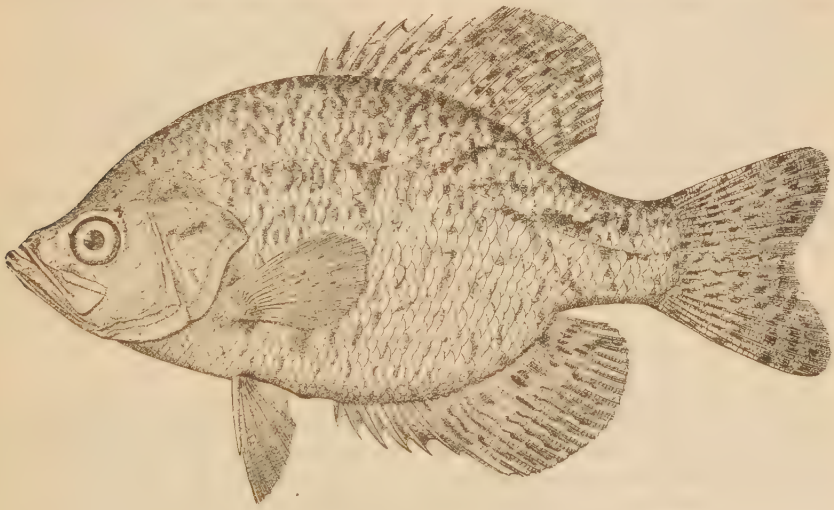

Fig. 1.—The black crappie, *Pomoxis sparoides.*

crappie particularly desirable for propagation in ponds. It was hoped that a careful study of its habits in certain Wisconsin lakes might furnish material for a comparison with the perch, which had been previously studied in the same localities (Pearse and Achtenberg, forthcoming report), and which is at its best in deep lakes. Stated in general terms, the object of this paper is to describe the habits of a fish which flourishes in shallow, muddy lakes, so as to furnish a basis for comparison with those of the fishes characteristic of deep, clear lakes.

[a] This fish is also known as the silver bass, strawberry bass, grass bass, barfish, and calico bass.

Judged by its structure, the crappie is rather specialized. The body is strongly compressed, indicating adaptation to movement through the narrow spaces between aquatic plants; the large, strongly upturned mouth suggests habits of feeding toward the surface rather than toward the bottom; the gill rakers are remarkable among those of sunfishes for their length and fineness, hinting at proficiency in straining plankton from the water; the unusually large median fins are well adopted for sudden rushes or for sustained swimming. The beautifully mottled colors suggest a habitat in the changing shadows among water plants.

Little has been published concerning the general habits of the black crappie. Forbes and Richardson (1908) believe that it shows a slight preference for hard bottoms when compared with its close relative, the white crappie, *Pomoxis annularis*. They state that "its hardy endurance of both heat and cold, and also of foul water, is especially favorable to its transportation and acclimatization." It is said by various writers to be carnivorous, subsisting largely on insects, crustaceans, and fish. Richardson (1913) has published some notes on its breeding habits.

The studies described in this paper deal mostly with crappies in Lake Wingra, but at intervals those from neighboring lakes were investigated. As far as possible, observations were made each week from February, 1916, to January, 1917. Lake Wingra is an admirable habitat for crappies, and they are among its dominant species. The lake's characteristics are as follows: Length, 1.6 miles; breadth, 0.8 mile; shore line, 4.5 miles; area, 0.79 square mile; maximum depth, 14 feet; mean depth, 5.5 feet.

In the preparation of this paper Miss Henrietta Achtenberg has helped materially by computing all the averages. Thanks are also due to Chancey Juday, who read the manuscript.

II. FOOD.

QUANTITATIVE AND QUALITATIVE DETERMINATIONS.

Forbes and Richardson (1908) state that the crappies are strictly carnivorous and that the dietaries of the two species in the United States are much alike. They believe, however, that *Pomoxis sparoides* depends more upon plankton than *P. annularis*. The observations made during the present investigations agree with their statements concerning the former. The food of the 140 black crappies from Lake Wingra (Table 1), during the nine months when observations were made, consisted of:

	Per cent.
Cladocerans	33.0
Chironomid larvæ	14.5
Amphipods	10.9
Chironomid pupæ	9.0
Fish	8.8
Ephemerid nymphs	5.6
Copepods	5.0
Adult chironomids	3.9
Odonate nymphs	2.3
Corethra larvæ	2.1
Hemiptera nymphs	.6
Silt and débris	.6
Adult Hemiptera	0.5
Plants	.4
Caddis-fly larvæ	.4
Grasshoppers	.2
Beetles	.2
Calcium-carbonate crystals	.2
Ostracods	.1
Algæ	.1
Unidentified insects	.1
Traces of moths, mites, snails, and leeches.	

TABLE 1.—FOOD OF ADULT CRAPPIES IN LAKE WINGRA, BY MONTHS, FROM FEBRUARY TO OCTOBER, 1916.

[No adults were examined from November to January, because none were caught. All figures referring to food indicate percentage by volume; + means a trace. Boldface type shows maximum for each month.]

Month.	Number examined.	Average length.	Fish.	Chironomid larvæ.	Corethra larvæ.	Ephemerid nymphs.	Caddis-fly larvæ.	Odonata nymphs.	Coleoptera larvæ.	Hemiptera nymphs.	Chironomid pupæ.	Chironomid adults.	Grasshopper adults.	Coleoptera adults.
		Mm.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
February	9	167.2	.....	0.6	0.1	10.1	.....	.....	.....	.....	.....	.....	.....	.....
March	4	202.0	.....	10.0	.....	1.9	.....	.....	.....	.....	.....	.....	.....	.....
April	12	147.5	.....	24.4	.....	**26.1**	.....	15.2	1.0	.....	7.5	.....	.....	1.7
May	19	174.1	2.5	21.3	.....	6.8	.....	1.8	.....	4.5	.....	**34.5**	.....	.....
June	37	165.2	.8	29.9	.3	2.6	.....	1.7	.....	.7	11.0	.....	.....	.....
July	35	166.0	18.8	22.6	4.2	1.3	.....	.5	.....	.....	**36.4**	.....	.....	.....
August	12	173.3	**39.0**	6.2	.7	1.6	3.8	1.6	.....	.....	23.9	.4	2.0	.....
September	8	177.0	5.0	.1	2.0	+	.....	.....	.....	.....	2.3	.....	.....	.....
October	4	170.4	13.5	15.0	11.2	.....	.....	.....	.....	.....	.....	.....	.....	.....
Average.	15.6	171.4	8.8	14.5	2.1	5.6	.4	2.3	.1	.6	9.0	3.9	.2	.2

Month.	Hemiptera adults.	Moth.	Unidentified adult insects.	Mites.	Amphipods.	Ostracods.	Copepods.	Cladocera.	Gastropods.	Leeches.	Algæ.	Plants.	Silt and débris.	$CaCO_3$ crystals.
	P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
February	.....	.....	.....	.....	**51.1**	.....	18.3	19.3	.....	.....	0.2	.....	.....	.....
March	2.7	.....	.....	.....	**40.5**	.....	7.5	35.0	0.1	.....	.....	0.1	.....	2.2
April	.....	.....	.....	.....	3.6	0.4	16.3	2.0	.....	.....	.....	1.2	0.5	.1
May	.....	0.2	.....	0.1	3.0	.....	.2	18.8	.....	.....	.1	.....	3.1	.....
June	.....	.....	0.5	.....	.1	.1	2.0	**44.3**	.....	.....	.....	1.6	.1	.....
July	.7	.....	.....	+	.2	.1	.2	12.0	.....	.....	.....	+	.....	.....
August	.8	.....	.....	.....	+	+	.1	15.7	.....	0.1	.....	.4	2.0	.....
September	.....	.....	.....	.....	+	.....	.1	**90.2**	.....	.1	.....	.....	.....	.....
October	.....	.....	.....	.....	.....	.....	.....	**59.9**	.....	.....	.2	.....	.....	.....
Average.	.5	+	.1	+	10.9	.1	5.0	**33.0**	+	+	.1	.4	.6	.2

The following list gives in more detail the exact constituents of the food of all the crappies examined from Lakes Wingra, Mendota, and Monona, 1915–1917, with periods of seasonal occurrence and the percentage which each item forms of the total food.[a]

[a] The methods used for making food examinations were the same as those previously employed for the perch and have been described in a paper by Pearse and Achtenberg, which is expected to be published shortly by this Bureau.

LIST OF CONSTITUENTS OF THE FOOD OF 276 CRAPPIES OF ALL SIZES.

The first figure indicates the number of crappies in which the food was found; when the item formed 1 per cent or more of the volume of the total food, this percentage is written in parentheses:

FISH, 39 (6.4), all year.
  Fish eggs, 1, May.
INSECT LARVÆ, 195 (24), all year.
  Unidentified larvæ, 5, February–October.
  Diptera larvæ, 170 (14.5), all year.
    Unidentified chironomid, 77 (7.5), all year.

INSECT LARVÆ—Continued.
  Diptera larvæ—Continued.
    Chironomus decorus, 12, April–August.
    C. digitatus, 11, May–November.
    C. fulviventris, 12 (1), April–November.
    C. lobiferus, 8, February–August.

INSECT LARVÆ—Continued.
Diptera larvæ—Continued.
C. nigricans, 1, April.
C. tentans, 2, November, December.
C. viridis, 5, August.
Corethra punctipennis, 20, all year.
Cricotopus trifasciatus, 1, May.
Orthocladius? sp.?, 3, February.
Palpomyia longipennis, 6, June–August.
Probezzia glaber, 7, May.
P. pallida, 18, May–July.
Protenthes culiciformis, 1, May.
Tanypus, sp.?, 11, June, July.
T. carneus, 1, August.
T. decoloratus, 6, November, February.
T. monilis, 3, July, August.
Tanytarsus gregarius, 14 (1.1), October.
Coleoptera larvæ, 2, August.
Dytiscid larvæ, 2, August.
Ephemerid nymphs, 54 (3.8), April–October.
May-fly nymphs, unidentified, 9, April–October.
Bætis, sp.?, 1 April.
Bætisca, sp.?, 15 (2.1), February–October.
Cænis diminuta, 16, May–August.
Callibætis, sp.?, 10, April–August.
Ephemerella, sp.?, 8, April–July.
Ephemerid, sp.?, 1, May.
Heptagenia, sp.?, 1, July.
Siphlurus, sp.?, 1, April.
Hemiptera nymphs, 12, May–August.
Corixa nymphs, 10, May–August.
Notonecta nymphs, 2, May.
Lepidoptera larvæ, 1, June.
Odonata nymphs, 28 (2), March–November.
Damsel-fly nymphs, 4, August–November.
Celethemis eponina, 1, April.
Enallagma, sp.?, 2, July.
E. antennatum, 2, June.
E. Hageni, 10, April–August.
Ischneura verticalis, 8, March-November.
Trichoptera larvæ, 3, April, August.
Caddis fly, sp.?, 1, August.
Hydrophilus, sp.?, 1, August.
Setodis grandis, 1, April.
INSECT PUPÆ, 126 (12.2), April–October.
Unidentified chironomid, 72 (9.5), April–September.
Chironomus decorus, 11, May–August.
C. fulviventris, 3, May, June.
C. lobiferus, 3, August, October.
Leptocerus, sp.?, 1, June.
Palpomyia, sp.?, 1, June.
Tanypus, sp. ?, 9, May, June.
ADULT INSECTS, 21 (2.4), May-September.
Unidentified insects, 1, June.
Beetle, sp.?, 1, May.
ADULT INSECTS—Continued.
Corixa, sp.?, 15, March–September.
Heptagenia, sp.?, 1, August.
Melanoplus bivittatus, 2, August.
M. femur rubrum, 1, August.
Moth, sp.?, 1, May.
Probezzia pallida, 5, October.
Protenthes, sp.?, 1, August.
Sminthurus, sp.?, 3, April, October.
Cordylura, sp.?, October.
ARACHNIDA, 12, May–July.
Unidentified mites, 7, May, June.
Limnesia histrionica, 5, July.
AMPHIPODA, 88 (7.4), all year.
Dikerogammarus fasciatus, 8 (1.4), February, June, August.
Gammarus limnæus, 6 (1.2), February, March.
Hyalella, 54 (4.8), all year.
ENTOMOSTRACA, 209 (43.7), all year.
Cladocera, 171 (21.2), April–November.
Bosmina longirostris cornuta, 3, April–August.
Ceriodaphnia quadrangula, 5, May, August.
Chydorus sphæricus, 28, August–December.
Daphnia, sp.?, 73 (10.1), April–November.
D. hyalina, 19 (3.5), June–October.
D. pulex, 17 (2.4), June, July.
Eurycercus lamellatus, 29 (1.4), April–November.
Leptodora hyalina, 30 (2.5), June–November.
Pleuroxus procurvatus, 3, July, October.
Simocephalus vetulus, 4, July, August, December.
Copepoda, 119 (19.4), all year.
Canthocamptus, 19 (3.1), October.
Cyclops, sp.?, 48 (13.3), all year.
C. bicuspidatus, 54 (2.3), all year.
C. fuscus, 2, February.
C. serrulatus, 5, February, March, April.
Diaptomus oregonensis, 1, October.
Ostracoda, 48 (3.1), all year.
MOLLUSCA, 1, March.
Planorbis, 1, March.
GORDIUS, 2, August, September.
PLANTS, 31, February–October.
Unidentified remains, 7, April–September.
Algæ, 21, February–October.
Filamentous algæ, 17, February–October.
Nostoc?, 1, October.
Spirogyra, 1, April.
Volvox, 1, August.
Ceratophyllum, 1, August.
Wolffia, 3, April, August.
DÉBRIS, 13, April–October.
$CaCO_3$ CRYSTALS, 4, February, March.

The constituents of the food clearly indicate the food preferences and feeding habits of the crappie. The following generalizations appear to be justified:

1. The most important foods are insects (38.6 per cent), particularly immature stages; cladocerans (21.2 per cent); copepods (19.4 per cent); amphipods (7.4 per cent); and fish (6.4 per cent).

2. Crappies do not feed much on the bottom. This is indicated by the scarcity of such foods as bottom mud, ostracods, oligochætes, and insect larvæ like *Chironomus tentans*, which typically live on or near the bottom and are abundant in Lake Wingra. The crappie differs from the perch in this respect (Pearse and Achtenberg, forthcoming report).

3. Crappies feed among aquatic vegetation in the open water and to some extent even at the surface. The chironomid larvæ occurring

in the food are largely those which live in the vegetation alongshore, and the same applies to a considerable degree to the cladocerans. The dragon-fly, may-fly, and damsel-fly nymphs eaten are those which are found among aquatic plants. The occasional high percentages of adult midges and midge pupæ, with the presence of grasshoppers and moths, indicate that feeding often takes place at the surface.

VARIATION IN FOOD.

Seasonal variation in the food of the crappies in Lake Wingra is shown in Table 1 and in figure 2. In the spring the food is made

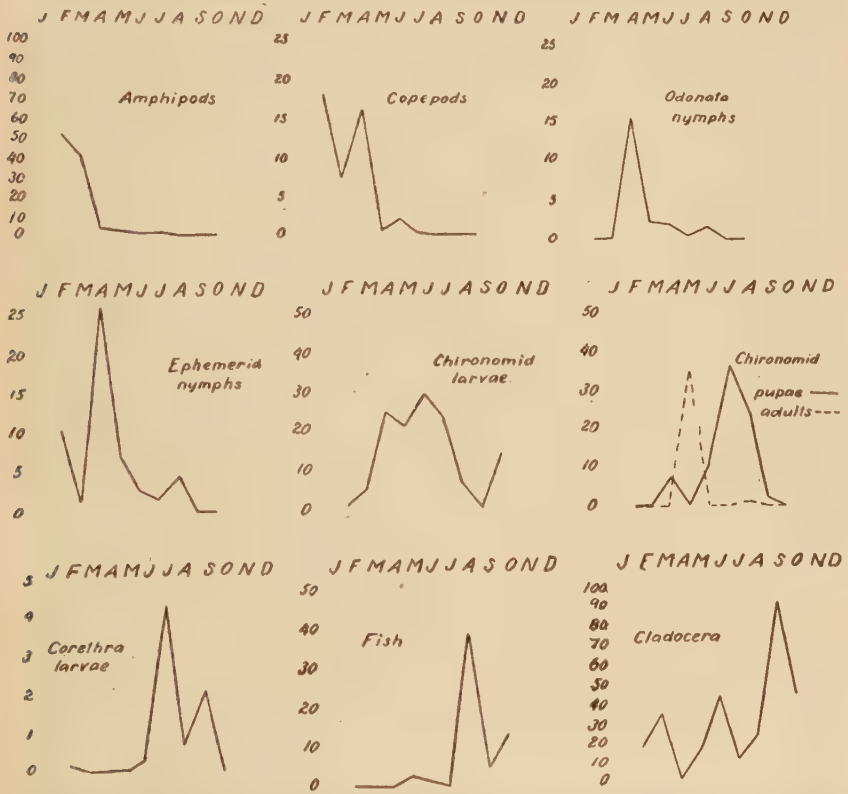

FIG. 2.—Percentage by volume of nine of the chief constituents of crappie food, so arranged as to show sequence throughout the year, from amphipods, with their maximum in February, to cladocerans, which attain their maximum volume in September.

up, for the most part, of amphipods, copepods, and cladocerans. During the summer larvæ, pupæ, and adults of insects are eaten in large quantities, but cladocerans continue to be utilized. In the autumn, cladocerans, small fishes, and chironomid larvæ are the chief foods. Adult crappies do not appear to feed in the winter. Though fishing was carried on each week with gill nets, or with hooks and lines, none was caught from October 14, 1916, until February 14, 1917 (Pearse and Achtenberg, forthcoming report).

On November 27, 1915, 13 crappies were caught in a commercial seine in Lake Monona. Six of these were empty and the other seven had eaten: 54.7 per cent Daphnia, 27.3 per cent Leptodora, 8.5 per cent *Chironomus viridis* larvæ, 4.3 per cent *C. tentans* larvæ, 2.1 per cent Bætisca nymphs, 2.1 per cent *Ischneura verticalis* nymphs, 0.8 per cent unidentified insect larvæ. These observations supplement those in Lake Wingra and indicate that the autumn food consists mostly of Cladocera and that little or no food is taken in winter.

In Lake Wingra the best catches are made in the spring after a day or two of warm weather. Apparently the crappies do not feed during cold weather, but begin in the spring with the first rise in temperature. Knauthe (1907) has noted that carp usually do not begin feeding in spring until the temperature has reached 6 to 8° C., but after a hard winter will begin at 3 to 4° C. During the present investigations no crappies were caught in Lake Wingra in the autumn after the temperature of the water reached about 10° C.

Though the variety in the food is rather limited, the crappie generally feeds at various seasons on the most abundant foods. Individuals caught at the same time and place had, as a rule, fed largely on the same items, and these were usually those most readily obtainable.

A number of observations indicate that crappies feed mostly at night or during the early morning and evening hours. For example, on July 15, 1916, 10 individuals were caught in Lake Wingra between 4 p. m. and 8 p. m. In 8 of these the stomachs were empty, and the other 2 contained small amounts of Leptodora. The intestines of all contained Leptodora in the anterior portion and chironomid larvæ, many chironomid pupæ, and Corixa in the posterior part. The inference in this case would be that as the midge pupæ migrated toward the surface during the early part of the night they were captured by the crappies; later the Leptodoras rose and were eaten.

TABLE 2.—FOOD AND GROWTH OF SMALL CRAPPIES IN LAKE WINGRA, 1916–17.

Date.	Number examined.	Average length.	Chironomid larvæ.	May-fly nymphs.	Dytiscid larvæ.	Damsel-fly nymphs.	Amphipoda.	Copepoda.	Cladocera.	Oligochætes.	$CaCO_3$ crystals.
		Mm.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
July 31	6	30.8	11.2	26.6	.....	.....	.....	40.4	20.8	1.3	.....
Aug. 29	10	37.8	2.6	4.8	1.5	11.4	2.5	53.1	23.5	.....	.....
Nov. 18	10	47.1	5.5	.....	.....	.....	15.0	43.6	35.2	.....	.....
Nov. 25	10	47.2	9.5	.....	.....	1.5	11.5	56.5	20.0	.....	.....
Dec. 2	10	47.2	7.8	.....	.....	.....	18.5	3.3	70.4	.....	.....
Jan. 19	5	48.1	7.0	.....	.....	.....	.....	92.0	1.0	.....	.....
Jan. 27	3	47.3	.....	.....	.....	.....	.....	93.3	6.6	.....	.....
Feb. 17	7	44.5	22.1	.....	.....	.....	.....	73.1	.....	.....	5.0
Average.	8	43.7	8.2	4.0	.2	1.6	6.0	56.9	22.2	.2	.6

During the latter part of the year 1916 and in the beginning of 1917, there was an opportunity to study the food and growth of young crappies which were captured in a small stream on the north side of Lake Wingra, near the west end. The results of these observations are shown in Table 2. There was rapid growth until the middle of November, but no appreciable increase after that time. On one very cold day in the winter, January 27, 1917, 8 of the 11

small crappies captured were empty, which indicates that the young, as well as adults, may cease to eat at times during the winter. The most important foods for the young crappies were Cyclops, cladocerans, and small insect larvæ. The young fishes eat the same general classes of foods as the adults, but depend more upon Cyclops and cladocerans than upon insect larvæ.

During the winter of 1917 two young crappies were kept in the laboratory in order to make observations on feeding, amount of food consumed, and rate of digestion, for comparison with young perch kept under the same conditions and simultaneously fed the same foods. The crappies each measured 58.5 millimeters in length (without tail) and had a volume of 4 cubic centimeters. The length of each of the perch was 62 millimeters and the volume 3 cubic centimeters. At the temperatures indicated the rate of digestion in the crappies, as judged by the first appearance of the foods in the feces, was as follows: Chironomid larvæ, 15.2° C., 24 hours; *Corethra* larvæ, 18° C., 24 hours; earthworms, 16.5° C., 21.3 hours. Amphipods, minnows, and snails were not eaten. Under the same conditions the record of the perch was: Chironomid larvæ, 18° C., 22 hours; *Corethra* larvæ, 18° C., 23 hours; earthworms, 17.5° C., 18.3 hours; minnows, 16.8° C., 18.7 hours. In proportion to their own volume the crappies ate as follows: Chironomid larvæ, 12 per cent in 6 hours; earthworms, 5 per cent in 1 hour. The perch ate chironomid larvæ amounting to 23 per cent of their own volume in 6 hours, and 20 per cent minnows in 2¼ hours. From these observations it is concluded that the rate of digestion is about the same in the two species, or perhaps slightly more rapid in the perch. The crappies were less aggressive in their feeding reactions, and ate less at a time than the perch. The two perch ate 31 chironomid larvæ in 6.3 hours; the crappies ate 20 of the same size in 6.3 hours. A comparison of the food of the adult perch and crappie is made in another paper (Pearse and Achtenberg, forthcoming report). The crappie feeds more on pelagic crustaceans and less on the small animals associated with the bottom than the perch.

III. REPRODUCTION.

Richardson (1913) describes a nest of the black crappie, found May 2, 1911, in a pond near Havana, Ill., after the temperature of the water had reached about 19° C., as follows:

> It was hollowed out under the leaves of a water parsnip and surrounded by smartweed and bog rush (*Junctus*). Some of the eggs were adhering to fine roots in the bottom of the nest, but most of them were on the leaves of the water parsnip at a level of 2 to 4 inches above the bottom of the nest. The nest was guarded by a male 6 inches long, who was so gentle that we could reach out a hand to within 3 feet of him before he moved away. Eggs taken to the laboratory hatched May 3 and 4. Both eggs and newly hatched fry are even smaller than those of the bluegill sunfish; and the great transparency of the new fry, along with their small size, make it difficult to see them in an aquarium.

In the spring of 1916 the ice left Lake Wingra March 26. On April 25 the temperature of the lake was 10.6° C.; May 13, 16°; May 27, 26°; June 11, 20.5°; July 20, 30°. On May 20 about a dozen male crappies were observed in nests along the base of a clay bank in one of the lagoons in Vilas Park, at the northeast corner of the

lake. Although careful observation was made with a water glass, no eggs could be seen. These nests were bare places on the bottom, adjacent to aquatic vegetation (fig. 3), and about 65 centimeters (2 feet) below the surface. Four of the males were caught on hooks baited with minnows. None of them was shedding milt, though all were nearly ripe. On the same day crappies were seen standing over nests at three places along the shore of the lake.

Nine males, but no females, were caught on that date. All were examined for food and were found to be well filled. The data for the nine individuals were as follows: Length, maximum, 225 millimeters; minimum, 158 millimeters; average, 193 millimeters. Food: Unidentified chironomid larvæ, 21 per cent; *Tanypus carneus* larvæ, 1.6 per cent; *Probezzia pallida* larvæ, 0.9 per cent; ephemerid nymph, 0.9 per cent; *Ephemerella* nymph, 0.5 per cent; *Cœnis diminuta* nymph, 1.7 per cent; Callibætis nymph, 0.6 per cent; *Corixa* nymph, 0.2 per cent; *Tanypus*, sp. ? pupæ, 0.5 per cent; unidentified chironomid pupæ, 25.2 per cent; *Chironomus decorus* pupæ, 9.2 per cent; mites, 0.1 per cent; *Hyalella azteca*, 0.7 per cent; ostracods, trace; *Eurycercus lamellatus*, 29.9 per cent; *Ceriodaphnia*, 0.1 per cent; fine débris, 6.6 per cent. Summarizing the foods, they are: Insect larvæ, 27.4 per cent; insect pupæ, 34.9 per cent; amphipods, 0.1 per cent; entomostracans, 30.7 per cent; fine sediment, 6.6 per cent.

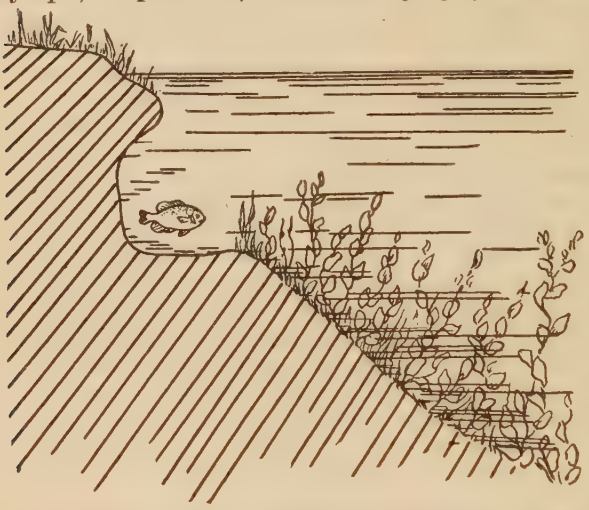

FIG. 3.—Section of bank of lagoon showing position of male crappie observed on May 20, 1916.

The abundance and variety of the food indicates that the males had fed actively among the shore vegetation, and this condition continued throughout the spawning season. In this respect crappies appear to differ from perch, which commonly neglect to feed during their active breeding period.

On May 27, 6 males, but no females, were caught. All had mature testes, but none was shedding milt. The gonads of the 2 females and 4 males captured on June 3 were all mature, but not quite ripe. On June 10 the catch was as follows: 3 mature females, 3 ripe females shedding eggs, 3 mature males, 3 ripe males shedding sperm. On June 17, 1 mature male was captured; on June 19, 4 mature males, 1 ripe male, 1 mature female, 1 ripe female, 1 female partly spent; June 26, 2 mature males; June 27, 3 mature males, 3 ripe males, 3 ripe females; July 1, 1 ripe male, 1 ripe female; July 3, 2 immature males, 1 ripe male, 1 immature female, 1 ripe

female; July 8, 2 ripe males, 5 spent females; July 15, 5 ripe males, 5 spent females.

The observations show that, in Lake Wingra, the most active spawning period came later in the season than at Havana, Ill., which is more than 200 miles farther south. It is also apparent that, in the present observations, spawning took place at somewhat higher temperature than those reported by Richardson (1913). Compared to the perch, the crappie breeds in warmer water. Perch begin spawning when the temperature is 8 to 9° C.; crappies when it is 19 to 20° C.

No observations were made on eggs or young in Lake Wingra until the latter part of July, in part on account of the turbidity of the water. After that, small crappies were captured at intervals until midwinter (Table 2). During the autumn and winter they were quite common in the aquatic vegetation alongshore, and after the lake froze over they were to be found in the mouths of the small streams, where the water was somewhat warmer than in the lake itself. In the latter habitat they were associated with other small fishes in the following proportions, as judged by catches with a dip net: *Pomoxis sparoides*, 34; *Pimehales notatus*, 27; *Eucalia inconstans*, 13; *Lepomis incisor*, 11; *Fundulus diaphanus menona*, 11; *Labidesthes sicculus*, 5; *Micropterus salmoides*, 2; *Ameriurus nubulosus*. In the mouth of the particular stream where observations were made crappies were the most abundant fishes.

IV. MIGRATIONS.

Judging from the catches in gill nets and on hooks[a] the crappies are active in Lake Wingra from the middle of February until the middle of October. In autumn, after the water temperature had fallen to about 10° C., they were no longer captured by either method of fishing in places where they had been more or less common throughout the warmer months. This may have been because the crappies did not move about, because they collected in one or more schools which did not happen to be encountered, or because they remained in places where no fishing was done.

Twice during the winter (Dec. 30 and Jan. 20) an adult crappie was seen in the shallow mouth of a stream (7.5° C.) at the northwest corner of the lake. These were the only adult individuals observed in Lake Wingra from October 14, 1916, to February 10, 1917, though fishing was carried on each week. When crappies began to bite in the spring, they were caught in only one locality for the first two weeks—over a hole about 30 feet deep, where a hydraulic dredge had worked during the preceding summer. Despite the occasional individuals observed in shallow water, the evidence appears to indicate that the majority of the crappies descend into the deepest regions of the lake in the autumn, and that they remain there in comparative inactivity throughout the winter. In the spring they return to shallower water, where they remain during the summer.

Apparently crappies often swim in small schools during the summer, particularly just before the spawning season. June 10, 1916, between 5 and 7.15 a. m., on the south shore of Lake Wingra, a man,

[a] For details of these catches, see Tables V and XXXII in a paper by Pearse and Achtenberg soon to be published by this Bureau.

fishing from a drifting rowboat with three hooks baited with minnows and whitebait, caught 52 *Pomoxis sparoides*, 1 *Lepomis incisor*, 1 *Lepisosteus osseus*, in an area about 100 meters wide and 400 meters long, where the depth was 2 to 3 meters. At the same time only four crappies were caught with similar equipment 300 meters west. At other times the catches on those areas under similar circumstances never exceeded five crappies. On May 20, 1916, four male crappies were caught in a few minutes; they were all on the same side of the gill net, within an area of 4 feet square. Apparently they had been swimming along together. There were other occasions when crappies seemingly swam in schools, but there were also many times when they were caught singly.

V. ENEMIES AND PARASITES.

Compared with the perch, the crappie is relatively free from parasites (Pearse and Achtenberg, forthcoming report). Though the perch in the Wisconsin lakes are heavily infested with proteocephalid larvæ, distomes, nematodes, and acanthocephalans, the crappies are generally free from such parasites. Of the 276 crappies examined, only 11 carried parasites, and the occurrence of all is given in the following list:

September 17, 1915; southeast corner of Lake Monona; crappie, 116 millimeters long; nematodes in the intestine.

October 27, 1915; Lake Wingra; two crappies, 48 and 38 millimeters long, respectively, both with nematodes in the intestine.

May 13, 1916; Lake Wingra; ripe female, 146 millimeters long with nematodes in intestine; young male, 112 millimeters long with cysts along whole length of intestinal wall.

May 13, 1916; University Bay, in Lake Mendota; male, 200 millimeters long; a trematode in intestine.

June 10, 1916; Lake Wingra; female, 160 millimeters long; cysts along intestine.

July 3, 1916; Lake Wingra; immature male, 112 millimeters long; tapeworm cysts on intestine.

August 20, 1916; male, 170 millimeters long; nematodes in intestine.

November 26, 1916; crappie, 44 millimeters long; proteocephalid [a] tapeworm cysts along intestine.

January 1, 1917; open stream west of University of Wisconsin; crappie, 58.5 millimeters long, a leech, *Piscola punctulata* attached to body.

Summary: Intestinal nematodes, 5; intestinal trematode, 1; cysts in peritoneum along intestine, 4; leech, 1.

VI. GENERAL DISCUSSION.

Though perch exceed crappies in numbers in Lake Wingra, they do not attain maximum growth.[b] The crappies are large and, in proportion to their greater sizes, abundant. Evidently the small, shallow lake is not a favorable habitat for the perch, but is satisfactory for the crappie. The differences between the two species may be summarized by stating that: (1) The perch feeds more by day and eats less of pelagic crustaceans than the crappie; (2) the perch

[a] Thanks are due to Dr. George R. La Rue, who identified these.

[b] The complete data for line and gill net catches have been given in a previous paper by Pearse and Achtenberg, which is expected to be published shortly by this Bureau. Judged by the catch per hour on hooks baited with minnows, the larger fishes are present in Lake Wingra in the following ratios: Perch, 145; crappie, 94; bluegill sunfish, 79; largemouth black bass, 3; pumpkinseed, 3; gar, 1. From the catch per hour in gill nets the following ratios were obtained: Perch, 307; bream, 32; crappie, 20; bluegill sunfish, 17; dogfish, 16; pumpkinseed, 12; pickerel, 9; carp, 7; smallmouth black bass, 5; largemouth black bass, 4; black bullhead, 2; gar, 1.

feeds on or near the bottom; the crappie finds its food among the shore vegetation or in the open lake; (3) the perch fasts more or less during the hot weather and while spawning; the crappie apparently eats throughout the summer, but takes little or no food during the winter; (4) the crappie spawns later in the season, when the water is warmer; (5) the perch has many parasites; the crappie, few.

The crappie is better suited to shallow lakes than the perch, because its normal activities are not interfered with by high temperatures, and it is thus able to breed and feed when food is most abundant. Its habits of feeding at twilight or during the night help in avoiding the unfavorable conditions associated with the warmth of midsummer. Its greater immunity to parasitic infections also enables it to live in the shore vegetation with less danger.

VII. SUMMARY.

1. This paper attempts to compare the habits of the black crappie with those of the perch, with the purpose of ascertaining why the former is better suited to shallow lakes and the latter to deep lakes.

2. The food of the crappie consists chiefly of insects, particularly immature stages, entomostracans, amphipods, and fishes.

3. In spring amphipods and entomostracans are the chief items in the dietary. During the warmer months crappies feed largely on insect larvæ, pupæ, and adults, and on cladocerans. In winter adult crappies take little or no food in Wisconsin lakes.

4. Feeding is most active at night, or in early morning and evening.

5. Young crappies feed for the most part on copepods, cladocerans, insect larvæ, and amphipods. During their first season they increase rapidly in size until the temperature of the water falls to about 4° C., but grow very little during the winter.

6. The rate of digestion in the crappie is about the same as in the perch, but less food is eaten at a time and feeding is more deliberate.

7. In southern Wisconsin lakes crappies spawn after the water temperature has reached 19 to 20° C., or more; while the perch spawn earlier, when the temperature is 8 to 9° C.

8. During the winter crappies remain in deep water and are comparatively inactive. In spring they come inshore and remain in shallow water throughout the summer.

9. Crappies have few parasites when compared with perch.

10. Though perch are more abundant than crappies in the shallow lake investigated, they do not attain large sizes. Crappies are large, and, considering their larger sizes, relatively abundant.

11. Crappies are better suited to shallow lakes than perch, because: (1) They can better endure high temperatures; (2) their feeding habits enable them to secure food more easily; and (3) they are less subject to infection by parasites.

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CRAB INDUSTRY OF CHESAPEAKE BAY

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Appendix IV to the Report of the U. S. Commissioner of Fisheries for 1918

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CRAB INDUSTRY OF CHESAPEAKE BAY.

By E. P. Churchill, Jr., *Assistant, U. S. Bureau of Fisheries.*

GROWTH AND SIZE OF THE INDUSTRY.

The blue crab (*Callinectes sapidus*) is the only species of crab found in Chesapeake Bay which has so far proved to be of commercial importance. The catching and preparing for market of this crustacean has given rise to an industry which, at the present time, embraces almost the entire bay in its scope. The crab of Chesapeake Bay was first put on the market in the year 1873 or 1874, shipments of soft crabs being made by Capt. John H. Landon, from Crisfield, Md., to the firm of John Martin, of Philadelphia. The hard-crabbing industry was initiated in 1878 by James McMenamin, who opened a plant at Hampton, Va., for canning the meat of the hard crab. The firm which he founded is still in operation, constituting the oldest existing crabbing firm in Virginia, if not in the whole bay.

Some trouble was at first experienced in finding a market for the crabs and the meat. Crabs were, to most persons, an unknown form of food and were even considered by many to be poisonous. Express agents and railroad employees, whose daily run took them through Crisfield, became familiar with the edible qualities of the soft crab and assisted in arousing the interest of fish and game dealers of the larger cities, such as Baltimore, Philadelphia, and New York. The Hampton firm carried on a very extensive advertising campaign. By these means the use of the crab as a food gradually spread until crabs and crab meat are now found in most of the important markets.

At first the soft crabs were shipped in heavy boxes which made the express charges high. No ice was used and consequently at least one-half of the crabs died en route. Mr. Martin, mentioned above, suggested that ice be packed about the crabs. A method of placing the crabs in trays in the boxes was devised, in order that those in any part of the box might be examined without disturbing the remainder. The present style of trays and boxes was introduced in 1884 by Isaac Tawes, of Crisfield.

Soft crabs were first caught by the use of hand or dip nets. Old oyster dredges then began to be employed, in a manner similar to that used in dredging for oysters. Next a special form of scrape without teeth was invented. The iron-mesh bag was replaced by one of cotton mesh, the patent for which was held by L. Cooper Dize, of Crisfield. This form of apparatus came into general use and is one of the chief means of taking soft crabs at present. The haul seine was formerly often employed in catching crabs but its use now is confined to a few localities in the northern part of the bay. No licenses were issued for its use in 1916. The shedding of crabs in floats began very shortly after the beginning of commercial catching. The style of

floats used was about the same as that in vogue at present. Attempts were made to confine immature hard crabs in pounds of various sorts until they became peelers and then to allow them to shed. This method was found to be impracticable, as it was necessary to handle the crabs too often.[a]

The use of the trot-line, principally in taking hard crabs, has been practiced since the inception of the industry. The dredge began to be employed in taking hard crabs at some time between 1900 and 1905.

Since its inception in the early seventies until 1901, the expansion of the crab industry in size and importance proceeded steadily. During the seven-year period from 1901 to 1908, the volume of the industry more than doubled, the catch increasing from 21,530,076 pounds of crabs in 1901, to 45,456,000 in 1908. No further figures relative to the size of the catch are available until 1915 is reached. In that year, at the close of this seven-year period, the catch amounted to 50,343,268 pounds, an increase of only about 5,000,000 pounds in comparison with an increase of about 24,000,000 pounds between 1901 and 1908. These facts and other data relative to the development of the crab industry are presented in concise form in the following table:[b]

COMPARATIVE STATISTICS OF THE CRAB PRODUCT OF MARYLAND AND VIRGINIA FOR VARIOUS YEARS FROM 1880 TO 1915.

Years.	Maryland.					
	Crabs, hard.		Crabs, soft.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
1880	1,166,667	$46,850	(c)	(c)	1,166,667	$46,850
1887	2,757,638	36,969	1,636,530	$133,788	4,394,168	170,757
1888	2,674,675	37,438	2,208,829	161,331	4,883,504	198,769
1890	2,388,099	31,723	4,056,110	228,690	6,444,209	260,413
1891	2,776,898	37,460	4,828,872	266,256	7,605,770	303,716
1897	5,333,316	39,949	4,115,879	177,637	9,449,195	217,586
1901	9,824,793	85,884	4,303,582	202,563	14,128,375	288,447
1904	12,665,282	168,996	5,732,865	189,851	18,398,147	358,847
1908 *d*	12,786,000	124,000	7,587,000	195,000	20,373,000	319,000
1915	22,491,675	335,375	7,602,207	329,276	30,093,882	664,651

Years.	Virginia.						Grand total.	
	Crabs, hard.		Crabs, soft.		Total.			
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
1880	2,139,200	$32,088	(c)	(c)	2,139,200	$32,088	3,305,867	$78,938
1887	626,820	15,479	(c)	(c)	626,820	15,479	5,020,988	186,236
1888	956,843	24,669	(c)	(c)	956,843	24,669	5,840,347	223,438
1890	2,584,794	28,210	440,310	$26,054	3,025,104	54,264	9,469,313	314,677
1891	2,208,071	32,683	585,956	29,379	2,794,027	62,062	10,399,797	365,778
1897	5,331,398	28,331	1,068,116	39,914	6,399,514	68,245	15,848,709	285,831
1901	6,113,277	52,863	1,288,424	65,972	7,401,701	118,835	21,530,076	407,282
1904	10,356,052	179,575	1,910,654	92,909	12,266,706	272,484	30,664,853	631,331
1908 *d*	23,001,000	239,000	2,082,000	87,000	25,083,000	326,000	45,456,000	645,000
1915	18,765,148	242,754	1,484,238	74,402	20,249,386	317,156	50,343,268	981,807

a The facts cited concerning the early history of the soft-crab industry were obtained from "The Crab Industry of Maryland," W. A. Roberts, Report of the Bureau of Fisheries, 1904, pp. 423 and 424.

b From Annual Report of the Commissioner of Fisheries for Fiscal Year Ended June 30, 1916, p. 64.

c Statistics not available.

d The statistics for 1908 are from data published by the Bureau of the Census.

The Annual Report of the Commissioner of Fisheries for the fiscal year ended June 30, 1916, shows that, in 1915, there were 10,290 persons engaged in the industry, the invested capital amounted to $852,777, and the value of the catch was $981,807.

The statistics collected during the course of the present investigation, and quoted below, present certain details of interest concerning the size of the crab industry in 1916.

States.	Licensed crabbers.		Dealers.	Catch.		
	Dip net, trot-line, and scrape.	Dredge.		Hard.	Soft.	Total.
	Number.	*Number.*	*Number.*	*Pounds.*	*Pounds.*	*Pounds.*
Maryland	[a] 3,618	.....	221	21,334,500	6,637,610	[c] 27,972,110
Virginia	[b] 1,055	83	49	16,343,010	1,234,140	17,577,150
Total	4,673	83	270	37,677,510	7,871,750	45,549,260

[a] These figures represent 894 dip net, 1,661 trot-line, and 1,063 scrape licenses.
[b] Dip net, trot-line, and scrape crabbers are not licensed separately in Virginia.
[c] The figures for the catch in Maryland are based in part on estimation, as it was found to be impossible for the author to visit all the smaller crab dealers, owing to the demands made upon his time by the more important features of the investigation.

Although the figures given in the preceding table for Maryland are based in part on estimation, it is felt that they represent the true conditions fairly accurately. The entire number of crab houses was known and the catch handled by the smaller houses, which were not visited, was estimated from that handled by houses of about the same capacity which were visited. It is safe to say that the catch in 1916 was smaller than that secured during 1915.

CRABBING GROUNDS AND LOCATION OF DEALERS.

The number of crabbers found at the different grounds furnishes something of an index of the relative abundance of crabs existing at that place and of the general adaptability of the region to their capture. For that reason, data showing the number of crabbers and crab dealers licensed during 1916–17 in the several tidewater counties of Maryland and Virginia are presented in the following table. The counties in the respective States are arranged in the order of the number of crabbers in each, those having the most being placed first.

LICENSED CRABBERS AND DEALERS IN MARYLAND AND VIRGINIA, 1916–17.

MARYLAND.

Counties.	Licensed crabbers.				Dealers.
	Dip net.	Trot-line.	Scrape.	Total.	
	Number.	*Number.*	*Number.*	*Number.*	*Number.*
Somerset	375	97	829	1,301	97
Dorchester	126	423	180	729	21
Anne Arundel	116	452	53	421	9
Talbot	1	310	1	312	20
St. Marys	138	132	.....	270	12
Queen Anne	.....	195	.....	195	8
Kent	47	113	.....	160	3
Calvert	89	3	.....	92	10
Baltimore	.....	63	.....	63	.....
Baltimore City	.....	33	.....	33	38
Worcester	.....	24	.....	24	2
Charles	2	10	.....	12	1
Wicomico	.....	6	.....	6	.....
Total	894	1,661	1,063	3,618	221

LICENSED CRABBERS AND DEALERS IN MARYLAND AND VIRGINIA, 1916–17—Contd.

VIRGINIA.

Counties.	Licensed crabbers.			Dealers.
	Dip net, trot-line, and scrape.	Dredge.	Total.	
	Number.	*Number.*	*Number.*	*Number.*
Accomac	409		409	[a] 13
Northumberland	200		200	
Elizabeth City	59	57	116	16
York	78	18	96	
Norfolk	59	1	60	11
Lancaster	53		53	
Mathews	40	6	46	
Westmoreland	44		44	
Middlesex	39		39	
Northampton	37	1	38	[b] 2
Gloucester	29		29	
King and Queen	19		19	[c] 2
Princess Anne	8		8	
Isle of Wight	1		1	
Total	1,055	83	1,138	49

[a] Also one at Franklin City, on the ocean side.
[b] There is 1 crab house at Willis Wharf, Va., on the ocean side, outside the scope of this report.
[c] Both are located at Westpoint, just over the line in King William County.

The relative importance of the different regions of the bay to the crabbing industry is worthy of discussion in some detail. For the sake of convenience, the county will be taken as the geographical unit. The tidewater counties of the Eastern Shore, beginning with the most southerly, will be considered first. The treatment of the counties of the western shore, beginning at the north, will then follow. It must be borne in mind that all figures showing the number of crabbers and crab houses are for the years 1916–17.

NORTHAMPTON COUNTY, VA.

There are in this county 37 crabbers, 1 dredge boat, and 2 crab houses, both located at Cape Charles City. No meat is picked out at these houses, but about 10,000 barrels of crabs are bought and shipped each year. During the winter they handle a portion of the dredge-boat catch of the southern part of the bay, shipping largely to Crisfield by the New York, Philadelphia & Norfolk Railroad. In this way the dealers of Crisfield are brought into competition with those of Norfolk and Hampton for the dredge-boat catch. Dredging is carried on during the winter months throughout the whole of the lower part of the bay, from the capes to about the latitude of the northern end of this county on the Eastern Shore, and the northern extremity of Mathews County, Va., on the western shore. The deeper waters of this part of the bay afford a fine field for dredging operations during the winter, since the crabs migrate in great numbers to this region in the fall and lie on the bottoms until spring.

The trot-line crabbers of the county work largely in the coves and creeks of the western side and sell to the firms at Cape Charles or haul their catch inland to stations on the New York, Philadelphia & Norfolk Railroad and ship directly to northerly points. There is no soft-

crabbing industry in the county, as immature crabs are not found in sufficient quantities. Most of them go farther north to shed.

ACCOMAC COUNTY, VA.

This county has 409 crabbers and 13 crab houses, the latter being located at points along the western side, at Deep Creek, Chesconnessex and Saxis, and on Tangier Island. No meat is picked out, but some hard crabs are shipped alive. The bulk of the effort is directed to the soft-crabbing industry.

SOMERSET COUNTY, MD.

This county has 1,301 crabbers, 829 of whom use the scrape, and 97 crab houses, 52 of which are located at Crisfield, the remainder sending their product either to Crisfield or to Deal Island, in this county. Part of the houses located in this county handle only hard crabs; 5 at Crisfield remain open all winter, using crabs which have been dredged in Virginia waters. Some handle only soft crabs; many handle both hard and soft. While immense numbers of hard crabs are shipped from this county, it is the home of the soft-crab industry. The best crabbing bottoms of the bay include those underlying the waters extending from the vicinity of Onancock, Va., situated at the southern extremity of Pocomoke Sound, northwest to Tar Bay, which is about midway of the western side of Dorchester County, Md. This expanse includes Pocomoke Sound, Tangier Sound, the mouths of the Wicomico and the Nanticoke Rivers, Fishing Bay, Honga River, and Tar Bay. The waters of these bodies include scores of the mouths of rivers, small bays, coves, and inlets of Accomac County, Va., Somerset County, Md., a small portion of Wicomico County, Md., and the southern part of Dorchester County, Md., on the east and north; and of Tangier Island, Va., Smiths, South Marsh, Hollands, Billy, and Hoopers Islands, Md., on the west. On the grassy bottoms underlying these waters young crabs congregate in vast numbers to shed, and a remarkably fertile crabbing field is afforded. The bottoms of this locality are those on which the scrape may be used to best advantage, because of their comparative smoothness. Eight hundred and twenty-nine of the 1,063 crabbers using scrapes are located in Somerset County.

Crisfield, located in the southern part of this county, on the little Annemessex River, is the center of the soft-crab industry of the world. It receives most of the soft-crab catch from Pocomoke and Tangier Sounds, and practically all the soft-crab catch from the western shore of Virginia. It also receives the hard-crab catch from a large part of Pocomoke and Tangier Sounds, in addition to quantities shipped in from a distance. Its shipping facilities consist of a daily boat to Baltimore and good train service.

Deal Island, at the northern end of Tangier Sound, is the second shipping point in importance in Somerset County. It has only 9 crab houses, however, 4 of which pick out the meat. Its only outlet to market is a daily boat to Baltimore. It receives a large part of the catch from the southern part of Dorchester County, which lies to the north.

WICOMICO COUNTY, MD.

This county has 6 crabbers, but no crab houses. The crabbing grounds are the mouths of the Wicomico and the Nanticoke Rivers and the catch goes to Deal Island.

DORCHESTER COUNTY, MD.

There are in this county 729 crabbers and 21 crab houses, the proprietors of the most of which are engaged in shedding out soft crabs. Those in the southern part send most of their product to Deal Island, though a few ship from Wingate, on the Honga River, as the Baltimore boat touches there. Those at the north, on the Little Choptank and the Choptank Rivers, ship to Cambridge, in Dorchester County, and to Oxford and Bellevue, in Talbot County. There is one picking house, which closes in the winter.

TALBOT COUNTY, MD.

This county has 312 crabbers and 20 crab houses. The crabbing grounds are in the coves of the mouth of the Choptank River at the south and Eastern Bay and its tributaries on the north. The houses are located on these waters; on the south the shipping points are Oxford, Bellevue, Neavitt, and Tilghman. Five packing houses are located at Oxford and one at Bellevue. None of these operate during the winter. The town of Oxford stands second in Maryland in the amount of crab meat picked out, being exceeded in this respect only by Crisfield. The shipping points on Eastern Bay are Claiborne and St. Michaels, 3 picking houses being located at the latter point, none of which operate during the winter. The Baltimore, Chesapeake & Atlantic Railroad from these points connects by ferry with Baltimore. One crabber in this county was using the scrape in 1916.

QUEEN ANNE COUNTY, MD.

There are in this county 195 crabbers and 8 crab houses. The crabbing grounds are in the northern part of Eastern Bay on the south and in Chester River on the north; the principal shipping center is Queenstown on the Chester River, its shipping facilities being a Baltimore boat three days a week and the Maryland, Delaware & Virginia Railroad, connecting by ferry with Baltimore. Other small shipping points are found up the Chester River. There are no picking houses, hard and soft crabs being shipped alive.

KENT COUNTY, MD.

There are here 160 crabbers and 3 crab houses. These houses ship hard and soft crabs alive, but no meat. The crabbing grounds are in the Chester River, the main shipping point being Rock Hall, which has service by the Baltimore boat three times a week.

There is no commercial crabbing carried on north of Kent County on the east and Baltimore on the west. Pooles Island, at the southern extremity of Harford County, is practically the northern limit of the crabbing industry of Chesapeake Bay.

BALTIMORE COUNTY, MD.

This county has 63 crabbers, but no crab houses; most of the persons licensed crab for pleasure or are the proprietors of resorts or "shores" in the vicinity of Baltimore.

BALTIMORE CITY, MD.

Baltimore has 33 crabbers, practically all of whom are crabbing for sport. There are 38 crab houses which obtain their crabs from shipping points down the bay; most of these sell soft and hard crabs and meat prepared at points below, Baltimore being the final market for a certain proportion of the crabs obtained in the bay. There are a few picking houses, some of which remain in operation all winter, using crabs which have been dredged in Virginia waters.

ANNE ARUNDEL COUNTY, MD.

This county has 421 crabbers and 9 crab houses, 3 of which pick out the meat, closing in the winter. The crabbing grounds are in the South and the Severn Rivers and the inlets of the eastern side of the county. The scrape is used to some extent here, this being the only county on the western shore in which this implement is used. The 3 picking houses and 1 soft-crab house are located at Annapolis. The other 5 crab houses are engaged in shedding crabs and shipping living hard crabs, and are located at various small places along the eastern side of the county, 1 being at Fairhaven at the southern extremity.

CALVERT COUNTY, MD.

There are here 92 crabbers and 10 crab houses, 4 or 5 of the latter being located at Solomons Island, at the mouth of the Patuxent River. There are no picking houses. The main crabbing grounds are in the Patuxent River, as the eastern shore of the county has few inlets. The main shipping points are Solomons Island and Broomes Island, farther up the river, living hard and soft crabs being shipped. A very few crabs are shipped from Coves Point on the eastern side of the county.

CHARLES COUNTY, MD.

This county has 12 crabbers and 1 crab house from which are shipped live hard and soft crabs. The crabbing grounds are the Potomac River.

ST. MARYS COUNTY, MD.

There are in this county 270 crabbers and 12 crab houses. Only live hard and soft crabs are shipped. The crabbing grounds are Patuxent River on the north and the Potomac on the south. Some of the persons licensed to operate crab houses in this county reside in Crisfield and send run boats to St. Georges Island, on the southern side of this county, to take the catch to Crisfield. Some crabs are shed out at Millers Wharf on St. Marys Bay and shipped to Baltimore by boat.

The crabbing industry in this county and that of Westmoreland, Northumberland, Lancaster, Middlesex, and Mathews Counties, Va., is greatly hampered by the entire lack of railroad facilities in any of the counties and by the very inadequate boat service. The Baltimore boats touch at points in these counties only three times a week. The bulk of the crabs have to be taken to Crisfield by run boats. If transportation facilities could be improved, the size of the industry could doubtless be much increased in this region.

WESTMORELAND COUNTY, VA.

There are here 44 crabbers and no crab houses. The crabbing grounds are the Potomac River, most of the catch going to Crisfield.

NORTHUMBERLAND COUNTY, VA.

There are in this county 200 crabbers, but no crab houses. The crabbing grounds are the Potomac, the Great Wicomico, and smaller rivers. Nearly all the catch goes to Crisfield. This is one of the important counties in the crab industry, the catch of soft crabs being quite large.

LANCASTER COUNTY, VA.

This county has 53 crabbers. There are no crab houses. The crabbing grounds are the Rappahannock River, on the south. The catch is sent to Crisfield.

MIDDLESEX COUNTY, VA.

There are here 39 crabbers, but no crab houses. The crabbing grounds are the Rappahannock on the north and the Piankatank River on the south, the catch being sold to Crisfield.

MATHEWS COUNTY, VA.

This county has 46 crabbers and 6 dredge boats. There are no crab houses. The main crabbing grounds are the Piankatank River on the north, the coves and inlets of the bay on the east, and Mob Jack Bay on the south. The dredge boats operate in the entire lower part of the bay. Their catch is taken directly to Hampton, Norfolk, or Cape Charles. The soft-crab catch, mostly taken from the Piankatank, goes to Crisfield; the trot-line catch of hard crabs from Mob Jack Bay is taken by run boats to Hampton.

GLOUCESTER COUNTY, VA.

There are here 29 crabbers, but no crab houses. The main crabbing grounds are the Mob Jack Bay on the east and the York River on the southwest. No soft crabs are handled. The trot-line catch is sold to run boats from Hampton.

KING AND QUEEN COUNTY, VA.

This county has 19 crabbers, but no crab houses, the catch going to 2 crab houses at Westpoint in King William County, Va. The crabbing ground is the York River.

YORK COUNTY, VA.

There are here 78 crabbers and 18 dredge boats. There are no crab houses. The main crabbing grounds are the York River and Poquoson Bay on the northeast and Back River on the south, the dredge boats operating in the lower part of the bay. No soft crabs are handled, the entire catch of hard crabs going to Hampton, Norfolk, and Cape Charles.

ELIZABETH CITY COUNTY, VA.

This county has 116 crabbers, 57 dredge boats, and 16 crab houses. The main crabbing grounds are the Hampton Roads on the southeast and Back River on the north, the dredge boats operating in the lower part of the bay. This county leads by far in the number of dredge boats, which operate during the winter months and sell to Hampton, Norfolk, and Cape Charles. One crab house is located at Phoebus and the rest at Hampton. All are picking houses and remain open for the most part throughout the year. A few close during a part of the summer when the season is slack, owing to the falling off in the supply of crabs during the month of August especially. This has been emphasized by the institution of a closed season on sponge-bearing crabs during July and August. There is no soft-crab industry in this county, since the bulk of the crabs caught here are adults. Hampton is the center of the hard-crab industry. More crab meat is picked out and shipped from this city than from any other on the bay. The adult crabs, especially the females, migrate in great numbers to the lower part of the bay in the fall. By the use of the trot-line in the summer and the dredge in the winter, hard crabs are obtained in sufficient quantities to enable the houses to operate throughout most of the year.

ISLE OF WIGHT COUNTY, VA.

This county has 1 crabber, the crabbing grounds being the James River.

NORFOLK COUNTY, VA.

There are here 60 crabbers, 1 dredge boat, and 11 crab houses. The last are located at Norfolk and Portsmouth, but only 3 or 4 are of any importance, and these remain open throughout the year; all are picking houses. There is little local soft-crab trade. The crabbing grounds are the James River, Hampton Roads, and Lynnhaven Roads, all on the north.

PRINCESS ANNE COUNTY, VA.

This county has 8 crabbers, but no crab houses. The crabbing grounds are Lynnhaven Roads on the north. The catch goes to Norfolk.

SUMMARY.

Hard crabs are caught and sold, in general, throughout the extent of the bay from the Capes to Baltimore. About as many are handled in Maryland as in Virginia. The center of the hard-crab industry in Maryland is at Crisfield, although the trade in hard crabs in Maryland is more evenly distributed among the different towns than in Virginia.

In the latter State, Hampton stands by far in the lead, handling more hard crabs than any other one point on the bay and at least three-fourths of the hard crabs shipped from Virginia. The congregation of the adult crabs upon the bottoms of the lower bay, during the winter, furnishes sufficient material to enable the houses at Hampton, Norfolk, Portsmouth, and Cape Charles to operate during most of the year.

The soft-crab industry is engaged in from Accomac County, Va., on the Eastern Shore, and the Piankatank River on the western, northward as far as Baltimore. Crisfield is the center of this industry, being favored with very adequate shipping facilities, and located on the best soft-crabbing grounds of the bay, viz, Tangier and Pocomoke Sounds.

SEASONS.

SOFT CRABS.

Since soft crabs are obtained only as a result of the molting of the young at the successive stages of growth and since this process takes place only during the warmer months, the soft-crab season occurs during the late spring, summer, and the early fall. In Virginia waters the season usually opens about the first of May or a little earlier, depending on the state of advancement of the spring. Crisfield firms begin taking the catch of the western shore of Virginia and of Tangier Island two or three weeks before soft crabbing is begun in Maryland waters. Soft crabbing usually ceases about the last of July or the middle of August in these Virginia counties, owing to the heat and the poor transportation facilities. During very hot weather, the soft crabs and peelers will not stand being kept until the day for the Baltimore boat, or the extra day involved in carrying them to Crisfield. The season usually closes in the latitude of Crisfield about the first or the middle of October. In the more northerly latitude of Annapolis and Baltimore, the season opens somewhat later than at Crisfield and closes earlier, extending from about the first of June to the middle of September or the first of October.

HARD CRABS.

The catching of hard crabs in Maryland waters is limited by law to the period between May 1 and November 1. This practically coincides with the natural trot-line season in this latitude. As the use of the trot-line depends on the seizing of the bait by the crab, this method of catching can not be practiced during the winter months, when the crab is numb and inactive from the cold. The law does not forbid the Maryland firms handling crabs which have been taken from the waters of Virginia. Five picking houses at Crisfield and a few at Baltimore remained opened during the winter of 1916–17, depending almost entirely upon the catch taken in Virginia waters by the dredge boats. A few crabs are taken in Maryland waters when dredging for oysters. These are allowed to be sold, as it is thought by those engaged in the industry that crabs so taken during the cold weather would die if thrown back into the water and would thus be wasted. Most of the crabs, however, migrate toward the lower part of the bay during the fall, and consequently not many are found in Maryland waters during the winter.

In Virginia the hard-crab season extends throughout the entire year, with the exception of a closed season during July and August on sponge-bearing crabs. The weather is of sufficient mildness to admit of trot-line catching being engaged in from about the first of April until the middle or last of November. In 1916 there were no crabs of any consequence taken by the trot-line at Hampton after December 1. The temperature of the water at that time was about 48° F. Catching by this method had ceased two or three weeks earlier farther up the bay. No crabbers were found using the trot-line in Mob Jack Bay after November 10 during the year under discussion. Catching with the trot-line began during the first week in April in 1917. During the remaining months of the year hard crabs are taken by the use of the dredge. The dredging season is limited by law to the period between November 1 and May 1 of the succeeding year. As the dredging season opens legally on November 1 and extends to May 1, there is some rivalry between the crabbers using this method and those working with the trot-line during the months of November and April. The trot-line men, operating at less expense than the dredge-boat owners, can sell their catch more cheaply. For that reason, and also because the crabs have not moved in sufficient numbers to deep water, dredging does not begin in earnest until nearly December.

LEGAL REGULATIONS.

MARYLAND.

Nonresidents are not permitted to take crabs in the waters of the State. Residents are required to pay a license fee of $1 for the privilege of taking crabs by any of the various methods used. Any person or firm desiring to pick, can, or ship cooked hard or soft crabs or crab meat must pay a license fee of $10. A fee of $5 is necessary for selling or marketing living hard or soft crabs.

It is unlawful to take or have in possession any hard crab, other than one in the peeler state, measuring less than 5 inches across the shell from tip to tip of spike, or a hard crab with eggs visible upon the apron; that is, a sponge crab. It is also unlawful to take or have in possession a soft crab measuring less than 3 inches from tip to tip of spike, or a peeler measuring less than 3 inches. No crabs of any sort may be taken between November 1 of any year and May 1 of the succeeding year.

For the enforcement of these regulations the State has provided as follows:

Licenses are obtained from the clerk of the court of the county in which the crabber resides and are good for the year of issuance and only in the county in which issued. Residents in Baltimore City obtain licenses from the clerk of the court of common pleas and may crab in Baltimore and Anne Arundel Counties.

At the opening of each crabbing season the State Conservation Commission appoints, at its discretion, a certain number of inspectors for each county in which crabbing is engaged in. These are stationed by the commission in the respective counties at the points where their presence is required. They report to the commissioners and are also under the direction of the deputy commanders of the State fishery force.

VIRGINIA.

Nonresidents are not allowed to take crabs from Virginia waters. Residents are required to pay a fee of $2 for taking crabs by any means other than by the dredge. The fee for the use of the latter is $25. For each boat used in buying crabs a fee of $5 is required, for each picking and crating house $10, and each canning and packing house $25.

No hard crab measuring less than 5 inches from tip to tip of spike may be taken. It is unlawful to take sponge-bearing crabs between July 1 and August 1 of each year. Dredging for crabs can be engaged in only between November 1 and May 1. Crabs may not be taken at night or on Sunday.

For the enforcement of the preceding regulations the following provisions have been made by the State:

Licenses are obtained from the oyster and crab inspector of the district in which the crabber resides and are good for the year of issuance in any part of the State.

For the purpose of the enforcement of both the oyster and the crab laws, the State is permanently divided by the State commissioner of fisheries into 49 districts. To each of these, with the exception of 3, an inspector, appointed for two years by the commissioner, is assigned. In 3 cases 1 inspector has charge of 2 districts. Each inspector attends to the enforcement of the laws relating to all sea foods in his district, issues the licenses, and is responsible to the commissioner.

METHODS OF CATCHING.

SOFT CRABS.

Soft crabs and peelers are caught by the use of the dip net, scrape, and trot-line.

Soft crabs are obtained from two sources. One of these is the crabs caught while in the soft condition, shortly after having shed; the other is the crabs which will shed within a few days if kept in captivity, the resulting soft crabs being marketed. The crabs which are soon to shed are known as "peelers." When a crab approaches the shedding state, a narrow line appears on the outer margin of the next to the outer segment of the fourth pair of legs, or "back fins." This line is white at first. A crab in which such a line is present is known as a "fat," "green," or "snot" crab, and is not saved as it will be apt to die in captivity before shedding. If left upon the bottom, the line within a few days becomes pink in color and the crab is then a peeler. It will usually shed within a few days. Crabs bearing such a pink "sign," or "ring," are saved and kept in live boxes and floats until they shed. The bulk of the soft crabs handled are obtained by the "shedding out" of peelers.

A certain percentage, however, of the soft crabs are taken when already in that condition. This practice is especially prevalent on the western shores of Virginia. The great majority of the crabs taken when soft are caught by the use of the dip net.

Dip net (Pl. I, fig. 1).—This consists of a one-fourth-inch iron rod bent into the form of a hoop about 1 foot across and carrying a cotton-mesh bag with openings about 1 inch square; the whole attached to

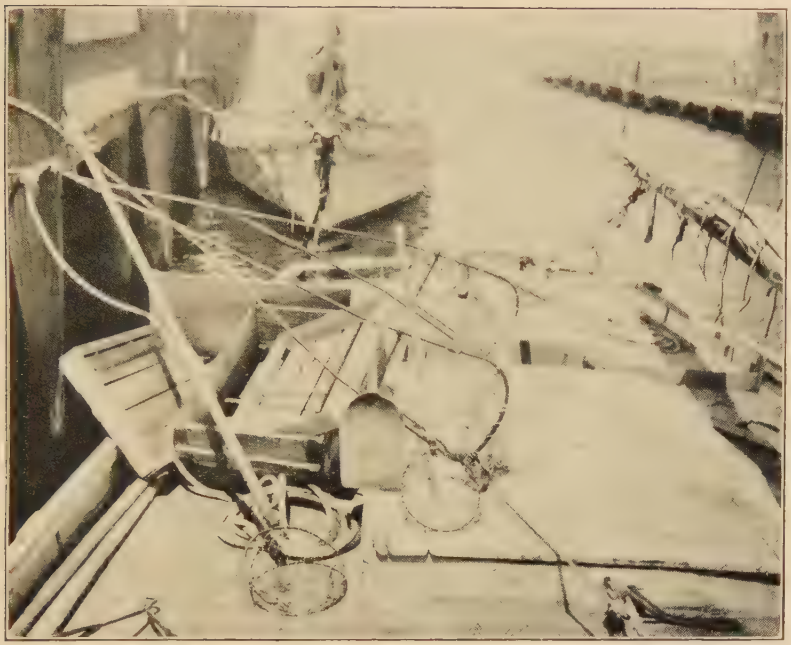

FIG. 1.—VIEW ON SCRAPE BOAT.

Showing a scrape (the triangular iron frame with the mesh bag), a crate with trays (for shipping soft crabs); a short-handled net for "fishing out" the soft crabs from a float, a long-handled net for catching crabs on the bottom, and a wooden bailing scoop.

FIG. 2.—SCRAPE BOATS, CRISFIELD, MD.

The crabs are culled in the shallow boxes secured to the inside of the gunwale.

FIG. 1.—PORTION OF TROT-LINE, SHOWING METHOD OF BAITING ON SNOODS.

FIG. 2.—TROT-LINE BOAT.

This is the style which is run by hand, the sail being used in going to and from the crabbing grounds.

a straight wooden handle 6 or 7 feet in length. It is used in shallow water and is carried in the hands, the crabber reaching into the water from a boat and scooping up the crab. This instrument is used especially in taking soft crabs, though some peelers are taken with it. It is used in the mouths of creeks and in the shallow waters of coves and inlets and in other places where the bottoms are not suitable for the use of the scrape.

Scrape (Pl. I, fig. 1).—This consists essentially of a triangular iron frame with a base varying in width from 2 to 5 feet. A cotton-mesh bag is attached to the upper side and extends about 6 feet behind the scrape. The scrape is dragged by a rope fastened to the apex, the base, which bears no teeth, coming in contact with the ground. Two scrapes are usually operated from a sailboat (Pl. I, fig. 2), varying in length from 20 to 60 feet. One scrape is dragged on each side of the boat, each being hauled in alternately by hand, and the contents dumped into shallow boxes attached to the side of the boat (Pl. I., fig. 2). Here the crabs are sorted out from the mass of seaweed, toadfish, oyster shells, etc., which is brought up by the scrape. The hard crabs are put into barrels and the soft crabs and peelers kept in boxes of various sorts while being brought ashore.

Although all sorts of crabs are taken with the scrape, the bulk of the catch so taken consists of peelers, the reason being that scraping is practiced only in the Crisfield region where the immature crabs predominate in numbers, and is carried on in fairly deep water. Crabs are apt to move inshore immediately before shedding, consequently soft crabs are more numerous in the shallower waters.

The crabber usually reaches the crabbing grounds at 3 or 4 o'clock in the morning and returns with his catch about 11 or 12 o'clock. Thus the crabs reach the dealer before the heat of the day, which is injurious to crabs confined in the live boxes.

Trot-line.—This apparatus is used at all seasons when the water is warm enough for the crab to move sufficiently to seize the bait. It is especially adapted to the catching of hard crabs, since a soft crab can not seize the bait and a peeler does not bite readily, as a crab does not eat much for a few days before it sheds.

The trot-line (Pl. II, fig. 1) consists of a line varying in diameter from three-sixteenths to three-eighths inch, and in length from 800 to 2,000 or more feet. A weight is secured to each end to hold the line in place while on the bottom, and a buoy to mark the spot is attached near the weight by a short drop line. In some cases the baits are suspended to the line by snoods 6 or 8 inches in length (Pl. II, fig. 1). This is the usual practice where no power or sail boat is used, the lines being "run" by hand—that is, the boat (Pl. II, fig. 2) is pulled along the line by hand. In other cases, the baits are secured in bights in the main line. This is done when the line is run by a power or sailboat. In this case the line passes over a spool or an oarlock set on an arm projecting about 1 foot from the side of the boat. As the boat is moved along, either by hand or by the engine or sails, the line is lifted and the crabber catches the crabs in a short-handled dip net, as they are brought to the surface while clinging to the bait. At Phoebus, Va., a patent net is used by some crabbers. This is attached to the side of the boat by an arm and secures the crabs as the line passes through it. When not in use the arm may be raised and the net thus suspended over the boat.

In hot weather the crabber often reaches the crabbing grounds at 3 or 4 o'clock in the morning. Crabs are thought to bite more readily in the early hours and the catch can be delivered to the dealer before the heat of the day, and consequently less risk of the crabs being killed by the heat is incurred. The line is set each morning and lifted when the catch is completed. It is coiled temporarily in the boat until the crabs are unloaded at the crab house. Then it is gone over and any empty snoods or bights are rebaited and the line carefully coiled in the stern of the boat, some salt is sprinkled over it to preserve the bait, and the whole covered with a rubber sheet, old blanket, or the like for the night. The bait commonly used is inedible beef or sheep tripe, some horsemeat, eels, skates, etc., being used in the spring when the crabs are not so active and consequently do not tear the bait to pieces so readily. A good day's catch with the trot-line is three to four barrels when the line is run by hand and twice that when run by power or sailboat.

Most of the soft crabs obtained by the use of the trot-line are those resulting from the "shedding out" of the female peelers of the pairs of mating crabs, or "doublers." The male, carrying the female, seizes the bait and is drawn up, and both are caught. At nearly all points outside of the region where the scrape is used, it was found that more than three-fourths of the peelers being kept to shed were females obtained in this way.

All crabs, caught by any of the methods described above, may be culled in compliance with the laws, as they are brought aboard the boat. Many crabbers carry a gauge with which to measure the crabs as they are caught. This consists of a flat piece of wood, something on the order of a ruler. A shallow notch, about one-half inch deep, is cut in one side. This notch is 3 or 5 inches long, depending on whether designed to measure soft crabs and peelers or hard crabs. The former are compared with the 3-inch notch, the latter with the 5. In some cases, those fishing for hard crabs fasten a similar gauge in the bottom of the net used in taking the crabs off the trot-line. Thus, at a glance, a crab may be measured fairly accurately as it lies in the net while being transferred to the barrel in the boat.

HARD CRABS.

Hard crabs are taken by the use of the scrape, the trot-line, and the dredge. The former two instruments were described above and no further discussion of their use seems necessary at this point.

Dredge.—The boats (Pl. III, fig. 1) used in dredging crabs during the winter season are about 50 to 60 feet in length and equipped with both engine and sail. The dredge (Pl. III, fig. 2) varies from 5 to 7 feet in width and is constructed on much the same plan as the scrape. It has, however, a row of teeth about 4 inches long on the side which drags on the bottom. The bag is only about 2 feet in length. The lower part of it is constructed of iron meshing, the upper of cotton. Two dredges are operated at a time, one being worked from each side of the boat. A chain a little over 1 inch in diameter is used to drag each dredge. The chain passes over a roller on the side of the boat, a little forward of the center, and around a pulley attached to a stout post placed upright in the mid line of the boat. Thence the chain passes down and around a windlass in the hold. For each dredge there

FIG. 1.—A DREDGE BOAT.

FIG. 2.—A DREDGE USED IN VIRGINIA FOR TAKING HARD CRABS DURING THE WINTER.

FIG. 1.—INSPECTING CRABS AS THEY ARE DELIVERED TO A RUN BOAT.

The inspector is seen standing at the left of the barrel, holding a gauge in the right hand. It is unlawful to catch or market hard crabs less than 5 inches in width. In the background is seen a trot-line boat "run" by sails.

FIG. 2.—"SHEDDING HOUSE," FLOATS, AND "POUND," OR INCLOSURE IN WHICH THE FLOATS ARE TIED, CRISFIELD, MD.

is a windlass operated by the engine and controlled from the pilot house. The dredges are hauled in alternately and their contents dumped on deck by two men, one working forward and one aft of the dredge. The dredge is then dropped overboard again. The crabs are raked from the débris by small hooks or the hands and shoveled into barrels, any dead individuals or any so badly crushed as to be unserviceable for cooking being thrown back. As there are no sponge crabs at this season of the year and since very few of less than 5 inches in length are caught in the dredges, culling to comply with the law is a short task. The débris is shoveled overboard. Dredging may be carried on in water varying in depth from a few feet to upward of 100 feet.

Ten barrels of crabs a day constituted about an average catch of a dredge boat during the years just previous to the issuance of this report. From day to day the catch may vary widely, from 1 barrel or 2 to 50 or more in exceptional cases. A buoy is sometimes left to mark a spot where the crabs are fairly abundant. They often move to another region, however, in the course of a few hours.

RUN BOATS AND BUY BOATS.

Scrape boats and dredge boats deliver their own catch directly to the crab house. They are enabled to do this as they are fairly large and equipped with sails or power or both. Much of the crabbing, however, which is done with the dip net and the trot-line, is carried on in regions so far from any dealer that it is inconvenient or impossible for the crabber, with his relatively small and often unequipped boat, to deliver his catch. To meet this difficulty, what are known as "run boats" or "buy boats" buy up the catch at these distant points and convey it to the crab house. When the boat is owned by a dealer and its captain is working on a commission, it is referred to as a "run boat." When the captain is buying crabs on his own responsibility and selling them where he chooses, it is styled a "buy boat." These boats are from 40 to 60 feet long and usually are equipped with both sails and engine. In many cases owners of dredge boats use their craft as run boats during the summer season. The run-boat operator usually is allowed 25 cents profit per barrel. Seventy-five to 100 barrels may be carried on such a boat. Trips are usually made each day to the desired region, where the boat is anchored in a cove or the mouth of a river, and the crabbers gather about and sell their catch from their boats (Pl. IV, fig. 1). A supply of bait is kept upon the run boat and this is sold by the pound to the trot-line crabbers.

As stated above, much of the catch of the western shore of Virginia is sold to run boats operating from Crisfield or Hampton. There are very few run boats or buy boats running from any other than these two places.

PREPARATION FOR MARKET.

A few of the hard crabs are shipped alive in barrels to the large markets by the individual crabbers. Nearly all of the catch, however, whether hard or soft, is sold directly or indirectly through the medium of run boats to crab shippers, "shedders," or packers. These

dealers maintain, at points as conveniently located to the crabbers and to transportation facilities as possible, what are referred to in general as "crab houses."

SOFT CRABS.

SOFT-CRAB HOUSES AND FLOATS.—If soft crabs and peelers are handled, the crab house is known as a "shanty," a "shedding house," or a "soft-crab house." It usually consists of a small wooden building supported on pilings over the water (Pl. IV, fig. 2). The floats in which the peelers are kept are tied to stakes in the water near-by. A wooden fence or breakwater is often built around the area in which the floats are tied (Pl. IV, fig. 2). At one side of this is erected a sloping platform on which the floats may be dried. The soft crabs which are brought in by the crabbers are bought for from 1 to 5 cents apiece and packed for shipment in the house. The peelers are put into the floats and left until molting occurs, when the resulting soft crabs are removed and packed for market in the house. The floats commonly employed (Pl. V, fig. 1) are made of pine or cypress and measure about 4 by 12 feet by 15 inches in depth. The sides are constructed of laths, placed vertically, with one-fourth inch spaces between them. The bottoms are made of 6-inch boards and are continuous. An 8-inch wing, also of wood, extends around the outside of the float halfway from the top. This supports the structure evenly on the water. This style of float is used throughout the Crisfield region and seems the best adapted to the purpose of any which were observed. At Oxford, Md., the floats are constructed in a similar manner, but are longer and are 2 feet in depth. Various other styles of floats are used at other points on the bay but in no great numbers.

The floats are hauled up on the sloping platform (Pl. IV, fig. 2) at intervals to allow their drying out and the cleaning off of débris and the sea growths which rapidly form upon them in the warm water of the summer season. Other floats take their place during this time.

The crabs are sorted into various lots before being put into the floats. Some floats will contain "green" peelers, which will not shed for several days; others, those in more advanced stages; and still others, the "shedding floats," will be filled with "rank" peelers, that is, crabs which are actually shedding or almost ready to do so. A crab in which the "back shell" has cracked loose from the apron is called a "buster" and will usually complete the process of shedding within an hour or so. No food is given the crabs while being kept in the floats, it not being considered practical to feed them for the short period during which they are kept there. Many crabs die while being kept in the floats, probably about one-third. The mortality is highest during hot weather. It has been suggested that the floats be shaded, but this has never been tried, as far as could be learned.

A crab when first molted is so soft that it would die very quickly if shipped. Therefore a few hours are allowed to elapse before it is removed from the float. If not removed for about 48 hours the crab will have become too hard for commercial use as a soft crab, a tough leathery shell having formed. Such a crab is called a "buckram." Buckrams which are found while crabbing are brought in by the crabber and sold to be cooked. They are, however, of little value for such a purpose as their tissues are watery and yield little meat.

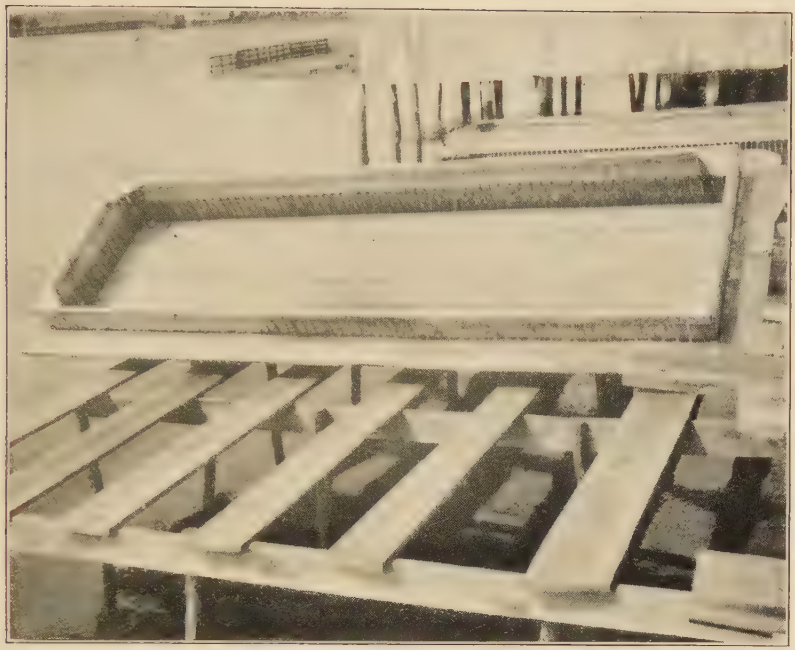

FIG. 1.—FLOAT IN WHICH "PEELER" CRABS (THOSE ABOUT TO SHED) ARE KEPT UNTIL SHEDDING OCCURS.

FIG. 2.—"FISHING OUT" THE SOFT CRABS FROM A FLOAT. THIS IS DONE ABOUT THREE TIMES A DAY.

FIG. 1.—ABOVE—TWO 5-GALLON CANS OF "LUMP" MEAT READY TO BE COVERED AND SHIPPED, ICED. BELOW—TRAY OF "PRIME" (BEST GRADE) SOFT CRABS.

FIG. 2.—TRAY OF "JUMBO" (LARGEST SIZE) SOFT CRABS.

Compare with man's hand. Covering of parchment paper and seaweed rolled to the side.

Crab dealers buy to keep the good will of the crabber, who might otherwise take his catch elsewhere. A direct waste is involved in the use of buckrams.

The marketable crabs are removed from the floats by the use of a small hand net (Pl. I, fig. 1). As the soft crabs are relatively inactive, the bag of the net is very shallow, the mesh being often stretched tightly across the hoop. The crab can then be gently slid from the net into the box without the crabber being obliged to reach into the net and remove it with the hand. The floats are examined three or four times a day and the soft crabs removed, "fished out" (Pl. V, fig. 2), and packed for market.

Grading and shipping.—Soft crabs are always shipped in the living state. At the present time none are canned before shipping. The unit of quotation is the dozen. Four grades are distinguished, depending on the size. These range from "culls," averaging about 3½ inches in width, through "medium," 4 to 4½ inches, and "primes," 5 to 5½ inches (Pl. VI, fig. 1), to "jumbos," 6 to 7 inches (Pl. VI, fig. 2). The primes are the best grade and command the best prices. The size limits of these grades are not fixed, but vary somewhat with the personality of the dealer, the exigencies of the catch and the state of the market. In shipping to some of the markets no separate class of jumbos is recognized, the large crabs being included in the primes. This is especially true in the early part of the season when few large crabs are yet obtainable.

Shallow wooden trays (Pl. VII, fig. 1) are used for packing the soft crabs for market. These vary considerably in size, being usually about 3 or 4 inches deep and 20 by 40 inches in the other dimensions. Each tray is of sufficient depth to accommodate one layer of crabs. Seaweed is spread over the bottom of the tray and the crabs are placed on it in rows in almost a vertical position (Pl. VI, fig. 1), each crab resting on its apron and lapping over the individual before it. This method of packing conserves space and the crabs live longer than if lying flat, since the water does not run out of their gills as readily. A sheet of parchment paper is placed over them and seaweed and crushed ice put over this. The paper and the seaweed on it may be rolled back, as shown in Plate VI, figure 2, to allow the crabs to be examined. Two or three trays are placed in a crate, the latter being of such a size that the trays fit neatly one above another without having room to slip about. There are sometimes strips on the inside of the crate to support the trays; sometimes each tray rests on the one beneath it. The crates are of various sizes, the one most commonly used weighing 80 pounds when packed with crabs, ice, etc. Such a crate holds on an average 15 dozen prime crabs. The crates are shipped by express. The percentage of crabs reaching their destination while alive is very good except in quite hot weather, when a number die.

HARD CRABS.

Hard-crab houses.—If the crab house is one at which hard crabs are handled, it is known as a "hard-crab house," or if the meat is picked out, as a "picking house" in Maryland and a "crab factory" in the lower part of the bay. These vary from small wooden structures to permanent buildings of wood or brick (Pl. VII, fig. 2), and are often well equipped with electricity, plumbing, and office

rooms. They are placed on a water front and have a wharf at which the crabs are unloaded from the boats. The apparatus for cooking the crabs is located either on the wharf or immediately within the house. Next the cooking room is the largest room in the building, where the picking is done. Smaller rooms where the meat is packed, office rooms, etc., usually adjoin.

In case a dealer handles both soft and hard crabs, the packing is done in a house devoted to both cooking hard crabs and the buying of soft crabs and peelers. The floats are tied to stakes in the water near by, in an inclosure such as is shown in Plate IV, figure 8. A board walk is usually built from the house out over the water to the float pound. To this are tied the small boats used in fishing out the crabs from the floats.

Shipping.—Hard crabs are to some extent shipped alive, packed with or without ice, in barrels. The large male crabs, called "Jimmies," are selected especially for such shipments. Sometimes, for shipments going only a short distance, twigs or branches with the leaves still fresh on them are packed about the crabs in the barrel and no ice used. Peach or fruit baskets are sometimes used in such cases. The great bulk of the hard-crab catch is steamed or cooked, the meat picked out and shipped on ice or after canning. Some cooked crabs are shipped whole on ice, the meat being picked out at the market.

Methods of cooking.—For cooking, the crabs are usually placed in circular iron baskets about 3 feet in diameter and 16 inches in depth (Pl. VIII, fig. 1). The basket is lifted by a hand-operated crane and lowered into a circular metal tank or "cooker" (Pl. VIII, fig. 1). This is just large enough in diameter to accommodate the basket and deep enough to allow two or three baskets at once to be placed therein. A heavy iron lid is clamped on the cooker and steam passed through it, usually for about 25 minutes. The crabs are thereby killed and cooked, their shells being bright red in color when removed.

One firm at Hampton, Va., places the crabs in iron cars about 7 feet long by 2 in width and depth, and rolls these cars on a track into rectangular, horizontally placed cookers which will hold two cars at once (Pl. VIII, fig. 2). The cars are made basket fashion of iron strips.

Various forms of wooden cookers are used also, especially at points in Maryland (Pl. IX, fig. 1). One of the commonest sorts is simply a box made of pine boards from 1 to 2 inches thick. The box is usually about 8 feet in length by 4 in width and depth. A grating made of wooden slats is placed about 4 inches from the bottom of the box. This holds the crabs up off the bottom and allows the steam to have free access to them. No baskets are used, the crabs being dumped directly into the box. Steam is admitted through a pipe from the boiler, the pipe entering the box near the bottom at one end. A lid of planks covers the box during the cooking. Small holes in the bottom allow the escape of the water from the condensed steam. After the cooking is completed, the box is turned upon one side by lifting on a wooden bar running along the side, and the crabs dumped out upon the floor of the cooking house. In some cases there is a door along one side of the box near the bottom to allow the crabs to be removed without having to turn the entire box over (Pl. IX, fig. 1). In other cases there are two large

FIG. 1.—CRATE AND TRAYS IN WHICH SOFT CRABS ARE SHIPPED.

FIG. 2.—A CRAB PACKING AND SHIPPING PLANT ("FACTORY") AT HAMPTON, VA.

Under the shed are boilers, cookers, iron baskets, etc.; cart removing scrap on the right; run boat in the center; trot-line boats on left.

FIG. 1.—IRON COOKER OR "KETTLE," THE USUAL APPARATUS EMPLOYED IN STEAMING HARD CRABS.

The baskets of crabs are hoisted in and out of the cooker by means of the crane. The tongs hanging on the upright post are used in picking out individual living crabs in case any sorting of the catch is desired.

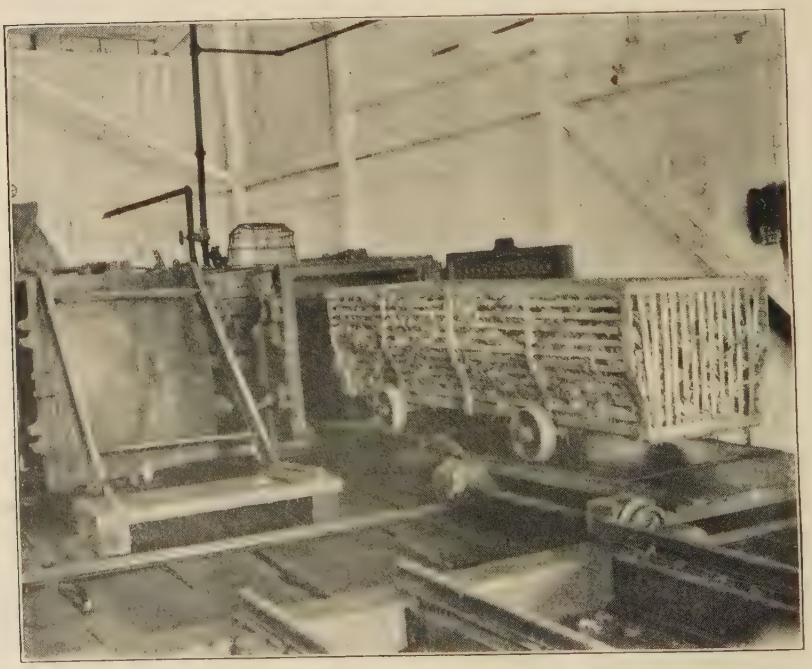

FIG. 2.—CAR OF CRABS READY TO BE RUN INTO A HORIZONTAL IRON COOKER.

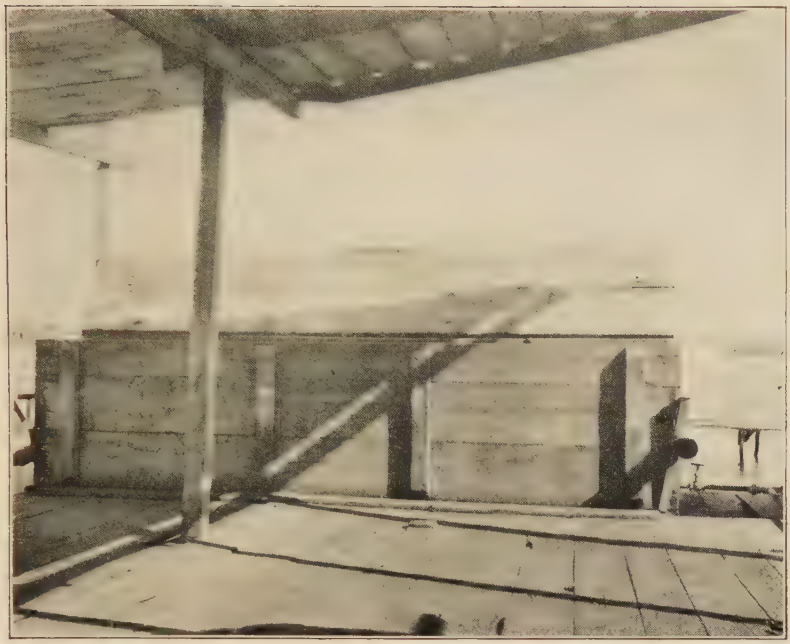

FIG. 1.—ONE FORM OF BOX OR WOODEN COOKER, USED AT POINTS IN MARYLAND.

The crabs are removed by taking out the wedges shown at the ends and thus allowing the front side of the box to drop forward.

FIG. 2.—A BARREL COOKER USED AT ANNAPOLIS.

After cooking, the barrels are lifted by the rope and pulley and swung on a crane over the picking tables.

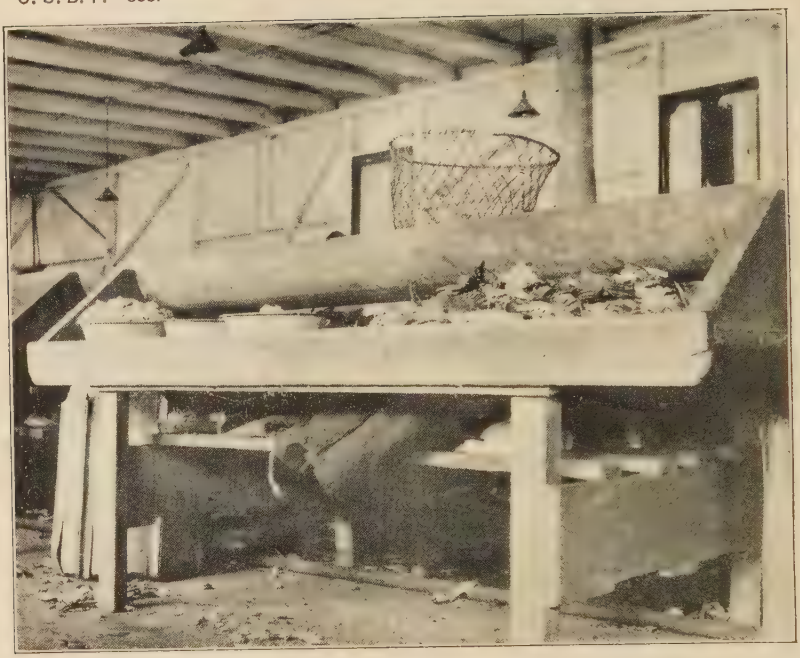

FIG. 1.—ONE FORM OF PICKING TABLE, SHOWING COOKED CRABS, PANS OF MEAT, AND BASKET IN WHICH CRABS ARE CARRIED IN FROM THE COOKER.

The waste is thrown into the trough at the top and thence pushed out the ends into large metal cans and dumped onto a barge outside.

FIG. 2.—"KNOCKING OUT," OR MAKING THE PRELIMINARY CLEANING OF THE SHELLS.

wooden rockers under the box and two on the side. During the steaming the box is kept steady by blocks placed under the ends of the rockers. When these are removed the entire cooker may easily be rolled over on to the rockers on the side and propped in a sloping position with the top lower than the bottom. The crabs can then be removed readily.

Two firms at Annapolis, Md., use cookers made from wooden barrels (Pl. IX, fig. 2). Two or more barrels are connected with the steam pipes in such a way that each may be operated independently. The pipe enters the side of the barrel (which stands upright) near the bottom and branches into the form of a U. Numerous openings along the U permit the exit of the steam. There are small holes in the bottom of the barrel to allow the water from the condensed steam to drain out. The crabs are placed directly in the barrels, no baskets being used. A gunny sack is placed over the top and on this the barrel lid. A bail and a hand-operated crane admit of the barrels being lifted independently and swung over the picking tables, where the crabs are dumped.

Picking crab meat.—When the other kinds of cookers are used, however, the cooked crabs are carried, usually in wire baskets, to the picking tables. These are of various sorts, one being represented in Plate X, figure 1. Others consist of a mere flat-topped table of pine boards or a shelf extending along the wall. The back shells are first removed and preserved separately. The meat is then "picked" out from the body of the crab, a sharp-pointed knife being used in the process. The picking is usually done by women or girls, though boys and occasionally men are employed. At Virginia points the pickers are Negroes. In Maryland white pickers as well as colored are employed, the two races sometimes working together in the same house. The amount picked out by each person is weighed or measured at intervals and an individual score kept, payment usually being made each Saturday. Payment is made according to the gallons or pounds of meat prepared. An experienced picker can prepare from 60 to 70 pounds of meat a day.

The crab meat is divided into three grades, depending on the region of the body from which it is taken. The three are usually kept separate by the pickers and quoted separately on the market. The "lump" meat is considered to be the best and commands the highest price. It consists of the meat from the muscles which operate the swimming legs, or back fins. The "white" or "flake" meat ranks next in value and is made up from the remaining muscles of the body with the exception of the claws. The "claw," as the meat from the last is known, ranks lowest in price because of its dark color, though it is considered by many to have the best flavor of the three grades.

The three kinds of meat are packed separately in tin cans (Pl. VI, fig. 1), with perforations in the bottom, and varying in capacity from 1 pound to 5. The cans of meat are packed in barrels with ice and shipped by express.

One gallon of meat weighs 5 pounds. From 3 to 4 gallons of meat may be picked from 1 barrel of crabs. This depends largely on the condition of the crabs, whether they are "fat" or "poor." In the spring and summer, crabs are usually poor; that is, the muscles

are shrunken and the tissues watery and not as much meat will be yielded. In late summer, fall, and early winter the crabs are fat, the muscles being full and yielding the best returns.

SHELLS.—The back shells, "shells" being the trade name, are first "knocked out" (Pl. X, fig. 2); that is, the portions of the reproductive organs and liver (both together popularly called "fat") which adhere to the shells are removed, usually by boys. The shells are then placed in large wire crates or baskets and washed by methods varying from a mere dip in sea water to a careful cleansing in vats of hot water (Pl. XI). For drying they are in some cases spread on shallow trays about 10 feet long by 4 feet wide (Pl. XII, fig. 1), consisting of a frame of narrow boards with a bottom of chicken-wire fencing. The trays are arranged in tiers in a shed with open sides (Pl. XII, fig. 1). In other cases the shells are spread, after washing, on a floor or on a wharf until dry. The shells are used in the preparation of deviled crabs, a certain number being sent in cartons or barrels with the shipments of meat.

CANNING.—The canning of the meat is practiced by only two firms, both located at Hampton. In the case of one of these it is a very small feature of the business, but in the other case it is the main part of their trade, the shipping of fresh iced meat being a side issue. For the purpose of canning, the methods of cooking and picking described above obtain. This firm uses the cars for cooking (Pl. VIII, fig. 2). All three grades of meat are canned together, the sizes of the cans ranging from a capacity of from 4 to 16 ounces. The meat keeps indefinitely, as in the case of other canned products. The actual methods employed in the canning process are kept secret.

SCRAP.—The "scrap" or waste remnants of shell, left after the meat has been extracted, is sold to fertilizer factories. It is removed on barges by water (Pl. XII, fig. 2) or by carts on land (Pl. VII, fig. 2). There are several factories, one being located at Bellevue, Md., one at Crisfield, Md., and one on Back River, Va., and others at various points.

PRICES AND WAGES.

SOFT CRABS.

The prices paid the crabbers and received by shippers vary with the seasons of the year. The average price received by shippers at Crisfield, in 1916, was, for primes 80 cents per dozen, highest $1.15 to $1.25; mediums 55 cents, highest 75 cents; culls 30 cents, highest 40 cents. In the season of 1917 the crabbers were paid from 2 to 3 cents apiece for soft crabs and peelers.

HARD CRABS.

The prices paid by the packers vary from about $1 per barrel during July and August to $4 and even $5 or $6 during February and March. The barrels, however, are of two sizes, the trot-line men using slat barrels and the dredgers sugar barrels, the former holding two-thirds as much as the latter. At Hampton some dealers buy the crabs by weight, paying the crabbers from 1 to 3 cents a pound. A slat barrel will hold about 110 pounds of crabs,

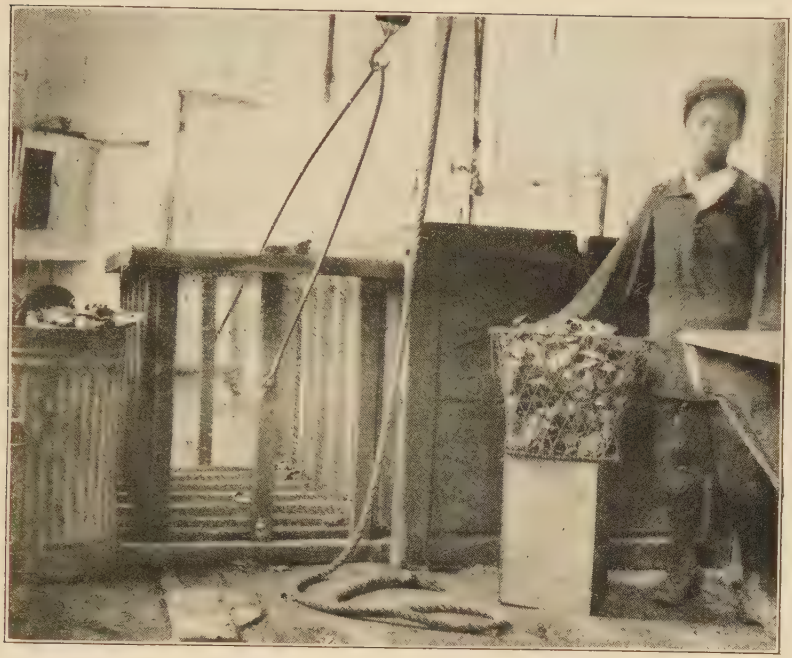

FIG. 1.—ONE METHOD OF WASHING SHELLS.

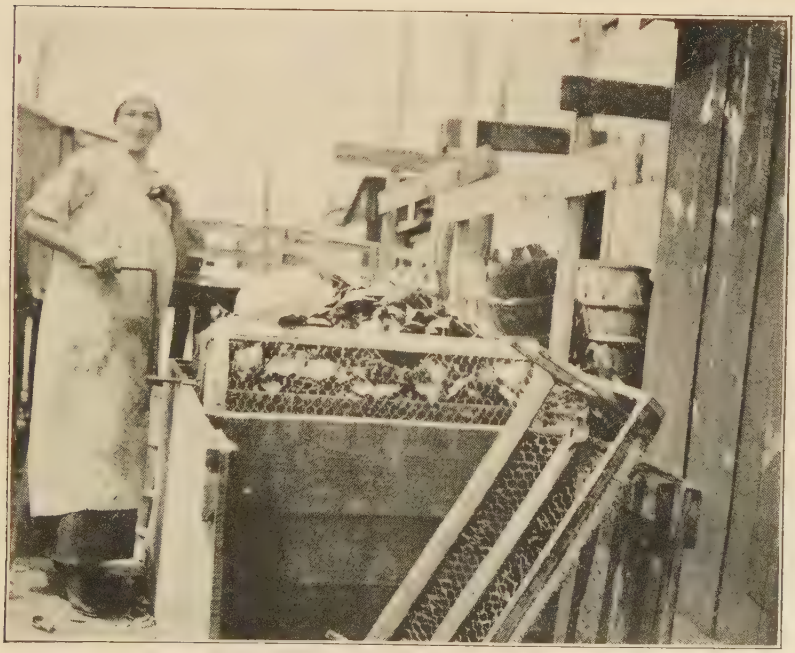

FIG. 2.—A METHOD OF WASHING SHELLS.

FIG. 1.—TRAYS OF SHELLS IN THE DRYING SHED, WHICH IS OPEN TO THE AIR.

FIG. 2.—EMPTYING "SCRAP" OR WASTE UPON A BARGE TO BE TOWED TO THE FERTILIZER FACTORY.

a sugar barrel about 165. Crabs are cheaper during the summer months because of their greater abundance, the greater number of crabbers, the slackening of the demand for the meat, and the fact that the trot-line men operate at a much lower expense than do the dredgers. During the hot weather the fresh meat spoils more readily and is not handled by as many customers as during the winter. The heaviest demand for fresh meat is at about the winter holidays. The demand for the canned meat is not subject to this peril of decay and is sold wholesale to jobbers at fixed prices throughout the year.

The prices received for the three grades of iced meat vary, then, with the seasons, being lowest in the summer and highest in the winter. A fair average for the year is lump meat $2 per gallon, white $1, and claw 65 cents. During the winter lump meat sells as high as $4 a gallon.

Scrap is sold to the fertilizer factories at $1 per ton at Hampton. At Crisfield it is sold at 3 cents per barrow load, this being a unit rather too elastic to suit the seller in many cases.

Pickers receive from 3 to 4 cents per pound. Experienced workers often make as high as $12 to $15 per week, which involves picking out 60 to 70 pounds of meat a day.

Laborers about the plants receive from $8 to $12 per week. Hands on the dredge boats receive $7 to $12 per week. Boys are employed to clean shells at 10 cents per 100 shells.

THE FLATWORM AS AN ENEMY OF FLORIDA OYSTERS

By Ernest Danglade
Formerly Field Assistant, U. S. Bureau of Fisheries

Appendix V to the Report of the U. S. Commissioner of Fisheries for 1918

THE FLATWORM AS AN ENEMY OF FLORIDA OYSTERS.

By Ernest Danglade, *Formerly Field Assistant, U. S. Bureau of Fisheries.*

INTRODUCTION.

During February, 1917, the Bureau of Fisheries and the Florida Shell Fish Commission made an investigation of a series of oyster areas on both the east and west coasts of Florida with regard to a reported destruction of oysters by a parasite, which later proved to be a polyclad turbellarian, or flatworm. As early as March, 1916, Dr. R. E. Coker stated, in unpublished field notes, that a worm, known locally as the "leech," was reported to occur occasionally on some of the oyster bars in the vicinity of Tampa, and sometimes to cause within a very short time an enormous mortality among the planted oysters, and that the fear of the pest served to deter the oyster planters from extending the cultivated areas. In the latter part of December of the same year T. R. Hodges, State shell fish commissioner of Florida, submitted to the Bureau a number of oysters, taken from the beds near Cedar Keys, affected with the so-called "leech." The oysters, which had been packed in ice, were alive when received in Washington, and contained from 2 to 3 flatworms each; however, the worms were dead, probably having been frozen in transit. The attacks of this parasite on oysters in these two localities, Tampa and Cedar Keys, are the only ones that had ever come to the attention of the Bureau.

The writer was informed by R. E. Gibson, an oyster dealer and planter of Tampa, Fla., that the worms, or so-called "leeches," had been observed attacking the oysters on some of the oyster bars in the Tampa Bay region at more or less regular intervals during the past 20 years, and particularly during the oyster season 10 years ago. The worms would disappear entirely from the beds for a period of 2 or 3 years and then reappear, the reoccurrences apparently running in cycles. Compared with the attack of the season 1916–17, the previous infestations and mortality were said to have been less extensive and harmful.

On the east coast of Florida a similar outbreak of the worms was observed 10 years ago at three or four points on Indian River. The principal infected localities in that body of water were Indian River Inlet, Bethel Creek, and Orchid. After a very serious and damaging attack, from which some oyster bars were practically depleted or greatly reduced in productivity, the trouble ceased and has not occurred there since. The oyster bars in the meantime have recovered their normal condition.[a] It is interesting to note that the destruction of oysters by turbellarians was reported by David G. Stead

[a] This information was furnished by E. F. McDonald, a practical fisherman of Port Orange, Fla.

from New South Wales in 1907.[a] His notes regarding the discovery of their injurious effect upon oysters are of interest:

A few years ago I found that this worm was known to a few of the oyster farmers of Georges River, who had repeatedly observed it amongst oysters on various leases, and that they distinguished it under the name of "wafer." As this name appears to be fairly suitable, I propose for the future to use it in speaking of this worm. Though, as I say, the wafer has been known to certain lessees, no definite connection between the oyster and this worm has been shown to exist, and no satisfactory evidence has been brought forward to show that the latter was to be added to the already long list of oyster pests. However, in the light of recent evidence, I think it will be found that this is a pest; that it is at times to be seriously reckoned with, and that it will be found to be fairly widespread in our oyster-producing waters.

At the end of July this year [1907], J. W. Swainson, of Georges River, handed to me for determination a number of examples of the wafer, which, he said, was very plentiful on his leases at that time. No visit was made by me for the purpose of investigating the matter. During the early part of September Fisheries Inspector Latta brought in a specimen of an oyster (from a lease in the Hawkesbury River) which was in the last stage of destruction by one of these flatworms, and which contained the worm itself. This specimen had been handed to Mr. Latta by J. Izzard, who had stated that the worm was very plentiful on his leases at Bar Island and Pelican Island, and that apparently it was destroying the oysters. Upon this it was so arranged that I made a short visit to the locality in question, for the purpose of obtaining more definite information. At Bar Island I found the wafer present in large numbers, and some were found actually at work between the valves of the oysters. Large numbers of gaping shells of oysters only recently killed were to be seen on all hands, while the same was apparent on Pelican Island (which is submerged at high water). In view of the very positive evidence obtained at the time, it is only fair to assume that at least a part of these—if not all, probably a very large percentage—had succumbed to the attacks of the wafer. I must here point out that although the common oyster worm (Polydora or Leucodore) was only too abundant on portions of these leases, none of the recently dead and gaping shells which I examined showed the least sign of its attacks or of the attacks of the common "Drill" or "Borer" (Urosalpinx), although I found the latter (previously unrecognized from this locality) to be fairly plentiful.

It is of interest to mention that at the time of my visit the oysters were all "opening very badly"; that is, they were in poor condition and were likely to remain so until the advent of a freshet in the river.

OCCURRENCE OF THE TURBELLARIAN IN 1916–17.

The distribution of this turbellarian in sufficient abundance to attract attention from oystermen, during the oyster season, 1916–17, appears to have been confined to the western coast of Florida, between Cedar Keys on the north and Tampa Bay on the south, a distance of about 110 miles. It was stated that the southern limits had probably extended, at some of the earlier periods, as far south as Cape Sable, making an approximate range of 300 miles.

In the vicinity of Cedar Keys, Port Inglis, and Tampa the greater number of the oyster bars, especially in the more saline districts, were infested and had suffered to a greater or less extent. The conditions were so bad that, for a time, the industry appeared to be seriously threatened. The loss, as reported, ranged from 10 to 20 per cent of the stock on some beds to the destruction of one entire bar. A planted bed of 35 acres in Tampa Bay was attacked by this worm and the mature and young oysters alike were said to have been completely annihilated. The bed had been planted just two years and had given promise of excellent returns.

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[a] David G. Stead: Preliminary Note on the Wafer (*Leptoplana australis*), a Species of Dendrocoelous Turbellarian Worm, Destructive to Oysters. Department of Fisheries, New South Wales, November, 1907; pp. 1–6. (No other references to turbellarians attacking oysters have come to the writer's attention.)

At Port Inglis and Cedar Keys the destruction during the season was estimated to be about 30 per cent. One or two localities, however, revealed a mortality as great as 90 per cent, but the excess should not be attributed to the turbellarian, since many of the empty shells or "boxes" contained spat which had set before the depredations of the worms had occurred, the mortality of these oysters being due evidently to other causes. When the devastation was at its height the affected oysters, as a rule, contained from 1 to 3 worms, although as many as 8 or 10 are said to have been taken from a single oyster. During the early part of the season about 100 oysters per barrel contained worms, but by February, the time of the examination, the trouble had abated to such an extent that not more than 1 or 2 worms were taken in 20 barrels of stock. It is worthy of remark that on the Port Inglis and Cedar Keys bars no small oysters were found or reported containing worms, nor did any of the empty shells of the small sizes show any malformations indicating that a defensive struggle had taken place.

DESCRIPTION OF THE FLATWORM.

Although this pest is known to the oyster dealers, planters, and shuckers of Florida as the "leech," it is an animal of very different type, belonging to the branch of wormlike animals called platyhelminthes, class turbellaria, and order polycladida.[a] Since the general character and habits of this turbellarian compare closely with the similar pest found in New South Wales, and described by Dr. Stead, the name "wafer" would be a more suitable and less misleading one for common use.

The worm is almost flat, more or less circular in outline, and measures from about one-half to three-quarters inch in diameter. It has occasionally been observed, when feeding, to be so distended that it would cover half the body of the oyster. When disturbed it usually rolls up into a sort of a tube, the margins then becoming curled and very irregular. The upper surface is drab to dark-brown in color, sometimes nearly black, and at times finely stippled with darker spots; the central portion, posterior to the eyes, is, as a general thing, of a lighter shade than the remainder of the surface; when taken from an alcoholic solution and allowed to dry, a whitish mucus coating is observed. The lower surface is whitish to cream color. The worm, when removed from the oyster, is soft and slimy, and on very moderate pressure breaks up or runs into a jellylike mass, apparently without much structure. When placed in alcohol of about 75 per cent strength it becomes firm and somewhat leathery.

PHYSICAL CONDITIONS.

The turbellarians were found to thrive in only those localities where the salinity of the water remained comparatively high, and not in areas where decided changes in density caused by freshets occur at certain seasons. The temperature is also an important factor in their activity and even their existence. If the water is chilled considerably below the normal it may cause their complete disappearance or

[a] Harry K. Harring, of the Bureau of Standards and custodian of Rotatoria, U. S. National Museum, is engaged in a study of the turbellarian, which will probably prove to be a representative of a new genus.

perhaps death. During the early part of February, 1917, there was a decided fall in the temperature throughout the greater portion of the State and many orange trees, early gardens, and much vegetation in general were killed; also many small fishes, crabs, and oysters on the shallower reefs were destroyed. Following this extreme, the worms practically disappeared from the oyster beds, and relief was expressed by those engaged in the oyster industry. Just about this time local rains reduced somewhat the salinity of the water, which was also an unfavorable condition for the worms.

Speaking of the turbellarian in New South Wales, Stead says: "Judging by my present data, they appear to be most plentiful during dry weather (and particularly while mild or high temperatures prevail), when the water of our estuaries is of greater density."

Dry, warm weather appears to be the most favorable condition for this enemy. The months of their greatest activity on the oyster bars are stated to be August and September, and if the weather continues warm, October, November, and December may be included.

The character of the oyster bottoms and the depth of water on the bars or reefs do not appear to have any direct influence on the depredations committed by the worms, since they were found active and damaging at all depths and on all kinds of bottoms, such as sand, firm mud, or shells.

THE ATTACK AND RESULT.

It is not known how the worm gains admission within the valves of the living oyster, and we were not fortunate enough, while examining the beds, to obtain any data along this line. It is probable that the soft, velvety creature may flatten itself into a very thin wafer-like form and slowly work its way between the partially opened valves without producing a reaction on the part of the oyster. Some oystermen, who have observed the habits of the parasite, are of the opinion that the entrance is made along the ventral margin or gill side, about halfway between the hinge and tips rather than at the tips themselves, since this is near the point where the worm is usually found. The first reaction of the mantle of an infected oyster takes place at this mid-portion of the shell. (See figs. 1 and 2.) It is possible that entrance is made during the larval or immature stage of the worm, at a time when admission could be more easily gained, and development completed within the oyster.

Regarding the method of attack the following remarks are made by Stead:

> Method of attack.—After gaining an entrance between the valves of the oyster, the wafer proceeds to wrap itself round the upper part of the oyster, as close to the great adductor muscle (which so powerfully keeps the two shells shut) as it can get. It then proceeds to pour out a great amount of thick, stringy, slimy mucus, which perhaps has the effect of partly digesting the body of the oyster, so as to prepare it for absorption by the wafer. Certainly in those which have come under my notice, the adductor muscle, usually the hardest part of the body of the oyster, is, after being attacked by the wafer, quite soft, although smelling quite fresh.
>
> One aspect of the case which is very puzzling is, as to how the worm gains entry between the shells of the oyster without the latter "closing down" on it; as, if it did, the wafer would surely be nipped in two.

The worm is usually found on the right side of the body of the oyster, near the heart, between the adductor muscle and the anterior

end or hinge. By carefully opening an infested oyster and removing the right valve, the worm may be observed as a thin sheet, closely adherent to the meat, and more or less covered with a slimy mucus. (See fig. 3.) It was stated by the oyster dealer,[a] who was interested in this subject, that he had found the worms in about the same relative position mentioned above, but on the reverse side or between the meat and lower valve, so that it was necessary after taking off the upper valve to turn the oyster over in order to see the worm.

It was not determined how long the oyster can successfully withstand an attack or whether it is able to recover after an invasion. It is the opinion of some dealers that the oysters are killed within two or three days, but this is evidently too brief a period, at least for the majority of cases. An examination of many of the oysters showed plainly, both in the meats and shells, that a hard, continuous, and defensive struggle for existence had taken place. The oysters, which were alive when opened, were poor, watery, and shriveled, to a degree depending upon the duration of the plague. Being robbed of its juices and its vitality probably reduced by secretions of the worm, starvation and death would ultimately follow. Up to this time no odor of decomposition was observed.

When carefully examined, the meat and shell often reveal the successive stages of the battle between the feasting turbellarian and the helpless oyster. With a slow but continued loss of its life juices and consequently contracting meat, the mantle gradually withdraws from the margins, particularly along the ventral side, and leaves a dark or blackened border or band of shell substance. (See fig. 4.) As the struggle continues, a thin ridgelike deposit of the shell substance may form along the gill side about one-half inch from the edge of the shell, and extend from the hinge to the tips. (See fig. 5.) At times a second or inner ridge is secreted. (See fig. 6.) The oyster, now being reduced to a smaller space by additional loss of its juices, has thus accommodated itself to a still smaller shell cavity. These ridges are doubtless a mechanical consequence of the shrinkage of the oyster; they indicate that the attack is persisted in and that considerable time elapses before death ensues. The ridges and other deposits are composed of regular shell material—calcium carbonate, and conchiolin; nacreous and crystalline layers are both present. (See figs. 7 and 8.)

CONCLUSIONS AND RECOMMENDATIONS.

1. Although oysters may be able to resist a brief invasion of the turbellarian, it does not appear that they possess the means to ward off an assault in harassing numbers, if long continued.

2. After the turbellarian has once gained admission within the oyster, there appears to be no method of combating the enemy. The defensive ridges deposited by the oyster afford only a temporary relief.

3. It is recommended that a careful working or cultivation of the beds in the infested district be carried on systematically, and that new, air-dried cultch and fresh seed stock be used when possible. All marine grasses and other objects under which the turbellarian

[a] Mr. Williams, Cedar Keys, Fla.

may secrete itself or deposit its eggs should be removed from the vicinity of the bars.

4. When it is desired to select a new area for planting and cultivation, it is advisable, other things being equal, to choose those localities where the water has sufficient depth to prevent overheating in summer, and also where the salinity may not attain too great a degree, as off affluents.

EXPLANATION OF THE FIGURES.

[All figures are two-thirds natural size.]

Fig. 1. Left valve, showing a thin deposit of shell substance along the ventral margin from hinge to tips, and covering nearly one-half of the inner surface of the shell. The deposit had curled and peeled somewhat before the photograph was taken. The shell is empty. (Taken from Cedar Keys, Fla., Feb. 10, 1917.)

Fig. 2. Both valves, showing the results of the struggle between the oyster and the worm. Notice the shell deposits, particularly along the ventral margins. Parts of the meat are still clinging to the shell at the muscle scar. The worm had escaped. (Taken from Cedar Keys, Fla., Black Point Bars, Feb. 12, 1917.)

Fig. 3. Left valve with the meat, and the turbellarian *in position* near the adductor muscle. Notice the shriveled condition of the oyster, and the retreat of the mantle from the edges of the shell. The worm had contracted to about one-half of its spreading capacity. (Taken from Port Inglis, Fla., Feb. 10, 1917.)

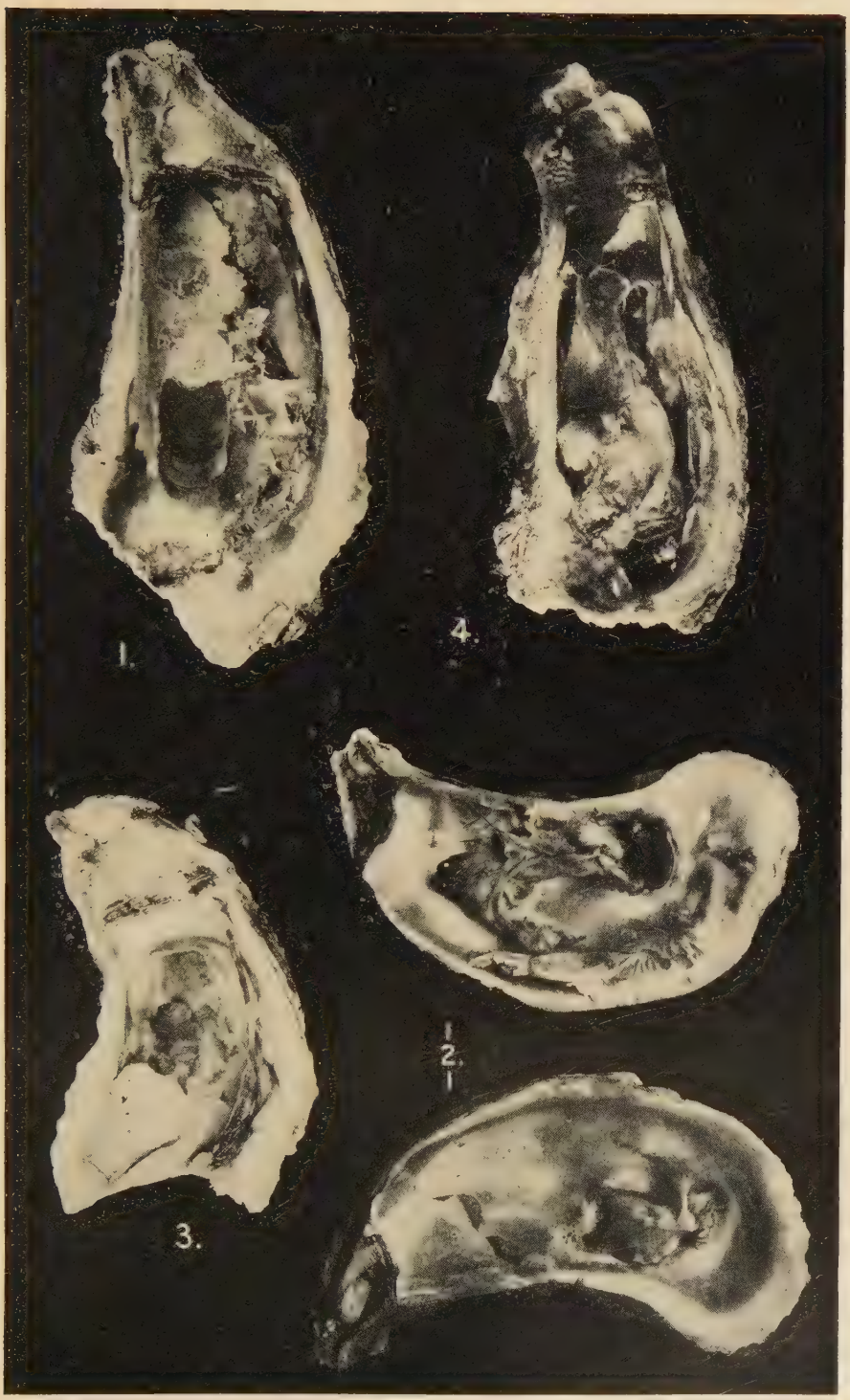
Fig. 4. Left valve with oyster showing the gills. Notice the "ridges" near the hinge and along the ventral margin. The oyster was shriveled and dead. The worm had escaped. (Taken from Port Inglis, Fla., Feb. 10, 1917.)

Fig. 5. Left valve, showing that the space occupied by the oyster was reduced, before death, about one-half. Notice the "ridge," beginning at the dorsal margin, then crossing adjacent to the hinge to the opposite side and extending to the tips. (Taken from Cedar Keys, Fla., Feb. 10, 1917.)

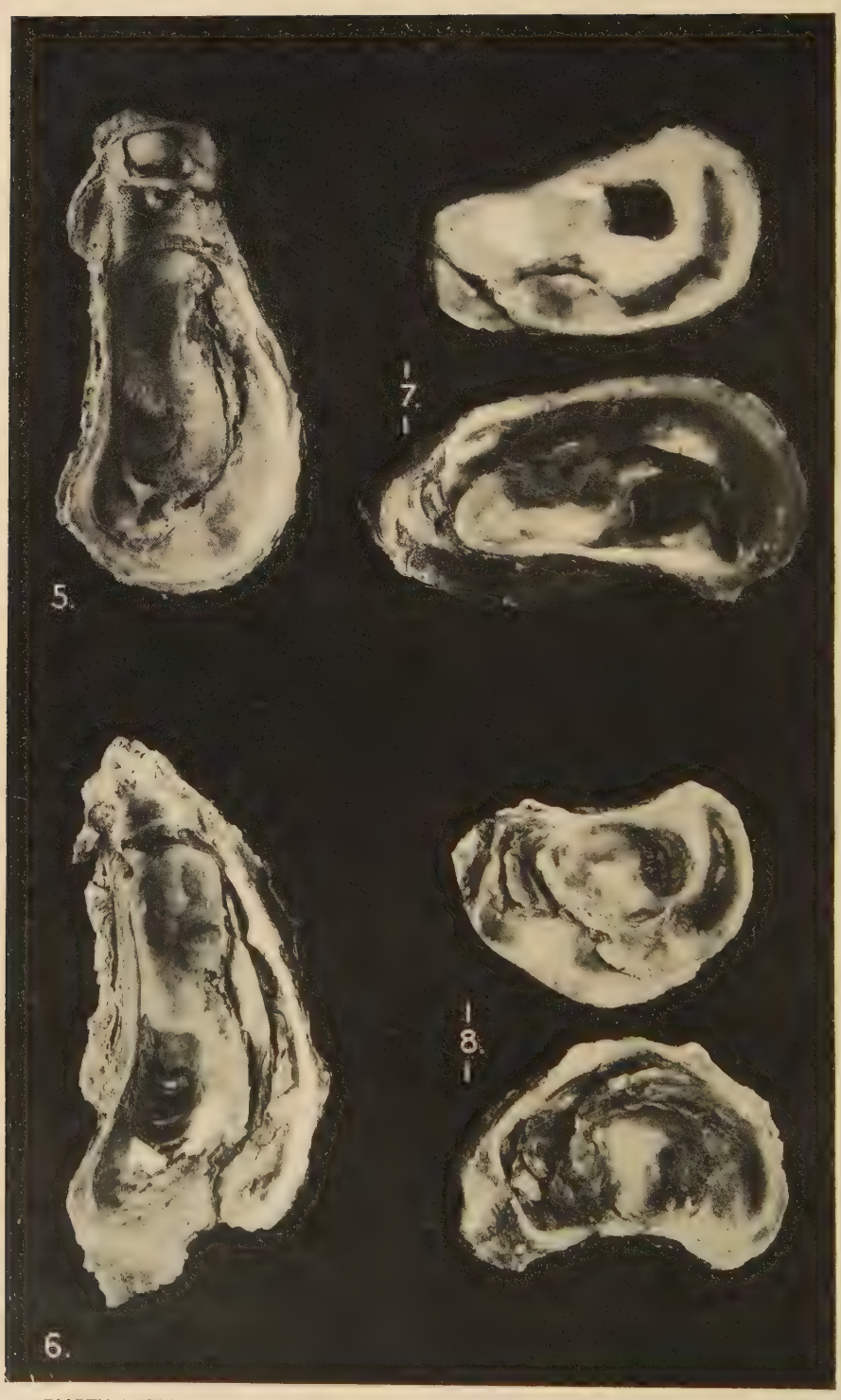
Fig. 6. Left valve, showing the reduced space occupied by the oyster just previous to death. Notice the two "ridges" or successive stages of retreat along the ventral margin, and the spreading out or fan-like condition at the tips. (Taken from Cedar Keys, Fla., Feb. 10, 1917.)

Fig. 7. Both valves, showing shell deposits of conchiolin and calcium carbonate. (Taken from Cedar Keys, Fla., Black Point Bars, Feb. 12, 1917.)

Fig. 8. Both valves, showing deposits of conchiolin and calcium carbonate. (Taken from Cedar Keys, Fla., Black Point Bars, Feb. 12, 1917.)



OYSTERS AND SHELLS, SHOWING THE RESULTS OF ATTACK BY FLATWORMS.



EMPTY SHELLS OF OYSTERS, SHOWING MALFORMATIONS RESULTING FROM ATTACKS BY FLATWORMS UPON THE LIVING OYSTER.

TWO SPECIES OF MENHADEN OCCURRING ON THE COAST OF NORTH CAROLINA

By Samuel F. Hildebrand
Superintendent, U. S. Fisheries Biological Station
Key West, Fla.

Appendix VI to the Report of the U. S. Commissioner of Fisheries for 1918

TWO SPECIES OF MENHADEN OCCURRING ON THE COAST OF NORTH CAROLINA.

By Samuel F. Hildebrand,
Superintendent, U. S. Fisheries Biological Station, Key West, Fla.

The relationship of the species or varieties of menhaden occurring on the Atlantic coast of America has been for many years a subject of conjecture among ichthyologists. The most accurate account yet available appears to be the one published in the fifth annual report of the U. S. Commissioner of Fish and Fisheries.[a] Subsequent writers contribute little to our knowledge of the affinities of the various forms which have been noticed. In order to definitely determine their true relationship, the study of a very large series of specimens from various localities throughout the range of the genus will be necessary. Such a study, augmented by field observations, would be very helpful.

The purpose of the present paper is to contribute in a small way to our knowledge of the menhaden by showing the affinities, as revealed by structural characters and habits, of two forms which have been noticed at Beaufort, N. C., but which have not been distinguished by writers.[b] One of the these forms is doubtless the typical *Brevoortia tyrannus* (Latrobe), as understood by recent writers. The other form differs from the typical one so essentially, both in form and in habits, that it should be regarded as a distinct species. The writer refers this species somewhat doubtfully to *Brevoortia aureus* (Agassiz), for, as already indicated, we can not be certain of the true relationship of the several forms, variously regarded as species, subspecies, or varieties, until a more thorough study is made of the genus. The addition of another name at this time would probably only add to the confusion.

The description of the "fatback" is based on a very large series of specimens collected at various seasons in the vicinity of Beaufort, N. C. The "yellow-fin shad" is described from mature specimens only, since the young have not been observed.

BREVOORTIA TYRANNUS (Latrobe).

Head, 2.98 to 3.3 in length of body to base of caudal fin; depth, 2.6 to 2.95; dorsal rays, 18 to 20; anal rays, 20 to 23; scales, in 47 to 54 oblique series along middle of side from posterior margin of opercle to base of caudal fin; vertebræ, 18+30.

[a] The natural and economical history of the American menhaden, by G. Brown Goode. Appendix to Report of U. S. Commission of Fish and Fisheries, pp. 1–529, 31 pls. Washington, 1879.

[b] I am indebted to Ed. Simpson and Arthur Newkirk, local fishermen, for first calling my attention to the different habits of the two species discussed in the present paper.

Body, oblong, compressed, rather robust; the back, moderately elevated, rather broad; the ventral outline, anteriorly slightly more convex than the dorsal profile; head, large, rather low, its depth at margin of preopercle less than its length; snout, rather short, 3.86 to 5.14 in head; eye, 3.25 to 5.27; mouth, large, oblique; maxillary, broad, reaching vertical from posterior margin of pupil, 2.12 to 2.44 in head; opercle and preopercle, with prominent radiating striations; gill-rakers, very long and slender, numerous, close-set; teeth, absent; scales, large, broad, rather regularly placed, not greatly reduced on caudal peduncle, strongly pectinate in adult, less so in young, the serrations very long and sharply pointed, with evident grooves between them at base; ventral scutes, prominent, 31 to 33 in number.

Dorsal fin, somewhat elevated anteriorly, with a low sheath of scales at base; caudal fin, deeply forked, the lobes a little shorter than head; anal fin, low, its base slightly longer than that of dorsal; ventral fins, small, scarcely longer than snout; pectoral fins, moderate, 1.62 to 2.17 in head.

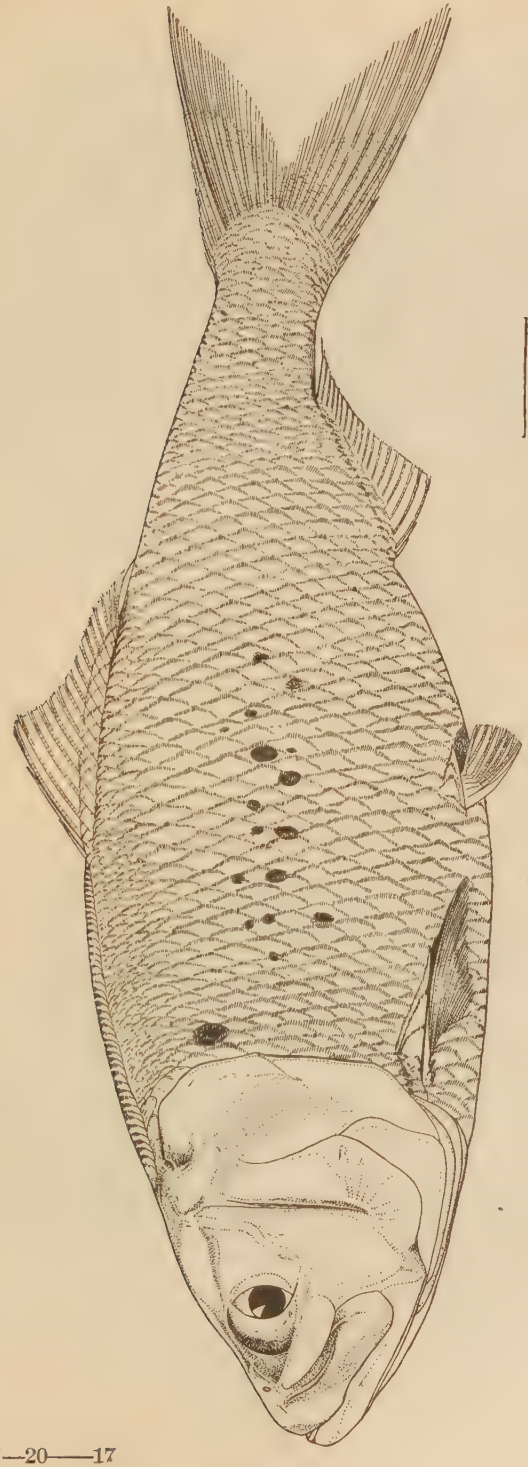
Color of back, dark green to bluish; sides, brassy; a round black humeral spot present, a variable number of smaller black spots behind it; fins mostly pale yellow, some of them often more or less punctulate with dusky.

This is the most abundant fish in the vicinity of Beaufort, where it is taken in large quantities, supplying eight factories which reduce it to oil and fertilizer (fish scrap). It is a migratory species, running in schools. Single schools ample to load a large fishing schooner are not infrequent. Large schools seldom enter the harbor, but small schools are common within the harbor. The species occurs at Beaufort throughout the warmer part of the year, but it is not always equally abundant. There is usually a period late in the spring, one in midsummer, and another late in the fall when large schools pass by. It is during these "runs," generally known as the spring, summer, and fall runs, that the fish are taken in large quantities. The fall run is, however, by far the most important one, as at this time the fish are not only much more abundant than during the other runs, but they are also usually bigger and fatter, therefore yielding more oil. Large, fat fish occasionally yield as much as 16 gallons of oil per 1,000 fish, the average for the fall fish being about 8 gallons per 1,000.[a]

This fish has long been used to a limited extent as food by the people of Beaufort and vicinity, but it is only within recent years that its use has become quite general. It is now the custom with a considerable proportion of the population to salt a quantity of menhaden each fall for winter use. It is, however, not yet marketable for other than local consumption. Since the fish is thoroughly wholesome, either in the fresh, salted, or smoked state, it is hoped that people of other communities, and particularly those living inland, will also soon learn to eat it and avail themselves of an abundant food supply. Experiments conducted by the writer show that the species when properly processed makes a palatable canned product.

The spawning habits of this fish are still imperfectly known. Menhaden heavy with roe are taken at Beaufort during the latter part of October and during November, and it is altogether probable that the eggs are pelagic and are deposited while the fish is on its southward migration. The smallest juveniles observed by the writer during several years collecting measured 50 mm. in length. Fish of this size are not infrequent in the harbor during May and June. They grow rapidly, reaching a length of about 95 mm. by the 1st of October. The full-sized menhaden is 300 to 350 mm. in length and is seen at Beaufort only during the fall.

[a] This information was offered by Charles P. Dey, a fertilizer manufacturer of intelligence and large experience.



Brevoortia tyrannus (Latrobe).

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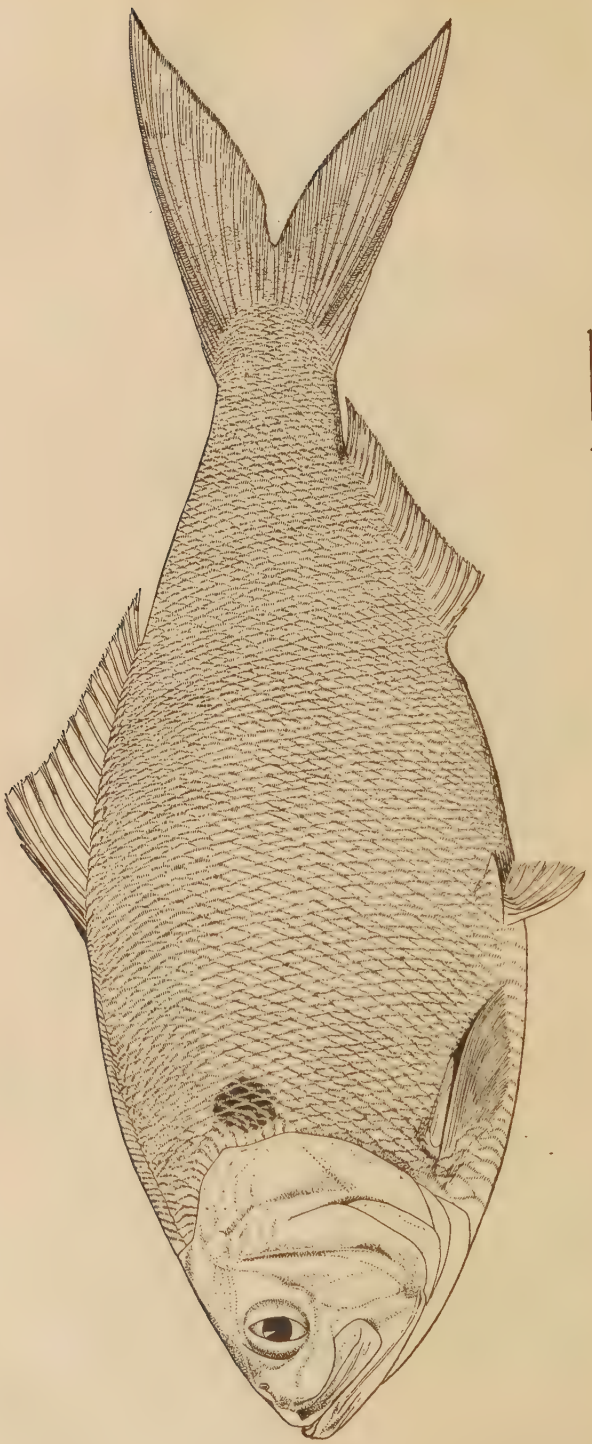

Brevoortia aureus (Agassiz).

FIG. 1.—SCALE OF B. TYRANNUS, TAKEN FROM BELOW ORIGIN OF DORSAL AND A LITTLE ABOVE THE MEDIAN LINE OF THE SIDE. × 10.4.

FIG. 2.—SCALE OF B. AUREUS, TAKEN FROM IDENTICAL POSITION ON FISH AS IN FIG. 1, AND FROM A SPECIMEN OF THE SAME LENGTH. × 10.4.

The menhaden feeds on floating plankton, which it is well able to obtain from the water through the mouth with its highly specialized gill-rakers. While the fish are feeding they perform characteristic whirling movements by means of which the fishermen are able to sight the schools.

This species is known by many names, viz, menhaden, bugfish, shad, oldwife, alewife, yellowtail, fatback, etc. Menhaden is the name most widely used throughout the range of the species, but at Beaufort it is nearly always called fatback. This name is in allusion to the broad back and the layer of fat which lies underneath the skin along the dorsal region.

BREVOORTIA AUREUS (Agassiz).

Head, 3.1 to 3.5 in length of body to base of caudal fin; depth, 2.25 to 2.7; dorsal rays, 17 or 18; anal rays, 21 to 22; scales, in 63 to 73 oblique series along middle of side from posterior margin of opercle to base of caudal fin; vertebræ, 7+39.

Body, deep, strongly compressed; the back rather strongly elevated; the ventral outline, anteriorly notably more strongly convex than the dorsal profile; head, short and deep, its depth at margin of preopercle equal to its length; snout, short, 3.45 to 4.23 in head; eye, 3.75 to 4.85; mouth, large, oblique; maxillary, broad, reaching slightly past vertical from middle of eye, 2.15 to 2.22 in head; opercle and preopercle, with very feeble striations; gill-rakers, very long and slender, numerous, close-set; teeth, absent; scales, small, ctenoid, very irregularly placed, at least along the back, much reduced on caudal peduncle, the serrations blunt, finger-shaped, without evident grooves at base; ventral scutes, well developed, about 32 in number.

Dorsal fin, somewhat elevated anteriorly, with a low sheath of scales at base; caudal fin, deeply forked, the lobes of about equal length, longer than head; anal fin, low, its base a little longer than that of the dorsal; ventral fins, small, a little longer than snout; pectoral fins, moderate, 1.47 to 1.62 in head.

Color of back, bluish-green; sides, silvery; a large black humeral spot present, no smaller black spots behind it; fins, all golden.

The "yellow-fin shad" is much less abundant than the fatback. It is not known to school, but is taken within the harbor throughout the summer, usually only a few at a time. It inhabits the deeper waters and, unlike the fatback, is a vigorous swimmer and fights bravely when captured. When taken in a net it runs here and there, striking the net with great force, and if an avenue for escape is anywhere open it is almost sure to find it. By this habit it may at once be distinguished from the fatback, which is a sluggish species, offering feeble resistence when captured, usually striking the net a single time and remaining where it comes in contact with the web while it is being hauled in.

This fish, although not taken in sufficient quantity to be of much economic importance, has been marketable at Beaufort for many years. The fishermen call it the "yellow-fin shad" and say that it has a better flavor and fewer bones than the fatback. The only difference the writer was able to detect, however, is that the meat of the present species appears to be a little less oily.

The spawning habits of this fish are unknown. Only adult fish, ranging from 250 to 330 mm. in length, have been observed. The writer during nearly three years of persistent efforts was unable to find the young or any definite clue to the spawning habits. Large fish, 300 mm. and more in length, may be obtained within the harbor throughout the summer, but fatbacks of this size, as already stated, are obtainable only during the fall.

The yellow-fin shad feeds on microscopic organisms, but it does not appear to feed at the surface as does the fatback.

The following comparison of the two species described above, based on specimens of like size, will aid in showing their relationship:

BREVOORTIA TYRANNUS.	BREVOORTIA AUREUS.
Body, elongate, robust; depth in length for 10 specimens, 2.6 to 3; average 2.85.	Body, deeper, less robust; sides less convex; depth in length for 10 specimens, 2.45 to 2.7; average 2.55.
Vertebræ, 18+30.	Vertebræ, 7+39.
Head, long and low, its depth at margin of preopercle less than its total length; head in body for 10 specimens, 2.89 to 3.3; average 3.07.	Head, short and deep, its depth at margin of preopercle equal to its total length; head in body for 10 specimens, 3.1 to 3.4; average 3.3.
Radiating striations on opercle and preopercle strongly developed. Scales larger, with long, slender, finely-pointed serrations in adult, evident grooves on margin of scale between the bases of serrations (Pl. I, fig. 1); rows of scales rather regularly placed, 47 to 54 oblique series along middle of side from margin of opercle to base of caudal; scales not greatly reduced on caudal peduncle.	Radiating striations on opercle and preopercle feebly developed. Scales smaller, with rather short and blunt serrations, no evident grooves on margin of scales between the bases of serrations (Pl. I, fig. 2); rows of scales very irregularly placed, 63 to 73 oblique series from margin of opercle to base of caudal; scales much reduced on caudal peduncle.
Caudal fin of moderate length, the lobes shorter than head.	Caudal fin long, the lobes longer than head.
A variable number of small black spots on side behind humeral spot; fins mostly pale yellow, more or less punctulate with dusky.	No small black spots on side behind humeral spot; fins all bright golden.
Body constantly with a dense coat of mucus.	Body almost wholly void of mucus.

ALASKA FISHERIES AND FUR INDUSTRIES IN 1918

By WARD T. BOWER
Agent, Alaska Service

Appendix VII to the Report of the U. S. Commissioner of Fisheries for 1918

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ALASKA FISHERIES AND FUR INDUSTRIES IN 1918.

By Ward T. Bower, *Agent, Alaska Service.*

INTRODUCTION.

The work of the Bureau of Fisheries in Alaska falls under certain main heads, which may be stated as follows: Enforcement of the laws and regulations for the protection of the fisheries and fur-bearing animals; administration of the Pribilof Islands Reservation, and matters incidental thereto; the collection of statistics and the dissemination of information regarding the fisheries; the making of certain scientific investigations, chiefly in regard to the life history of the salmon and in connection with the fur-seal herd; and the conduct of fish-cultural operations.

The work of the Alaska service in regard to the fisheries and fur-bearing animals has been devoted in considerable measure to the enforcement of the laws and regulations. The patrol of the fishing districts was extended by the charter of several small power boats and the employment of a number of men temporarily as stream watchmen in the central and southeastern sections. The census of red salmon ascending Wood River was again taken, and the private hatcheries were inspected. Work was continued in the opening up of streams for the spawning of salmon.

Three formal hearings were held at Seattle in regard to fishery operations in the streams of southeastern Alaska, in the Copper River, and in the Yukon River, and as a result formal orders were issued imposing restrictions on operations. Detailed statistics were assembled covering practically all features of the varied fishery industries of the Territory. Statistics of the shipments of furs were also compiled.

The work in connection with the Pribilof Islands expanded greatly in 1918 with the resumption of commercial killing of seals. A number of natives were secured from Unalaska to aid in the work, and temporary assistants were employed for sealing operations and general construction and repair work on the islands. Necessary transportation of supplies and products was furnished by the Bureau's steamer *Roosevelt*, together with some cooperative assistance by the Navy Department. Fur-seal skins and fox skins were taken and preserved as usual. A by-products plant was erected on St. Paul Island for the conversion of seal carcasses into oil and fertilizer. Cold-storage facilities were planned, and the general administration of the natives' affairs was carried on. A census of the fur-seal herd was taken as heretofore. Two sales of fur-seal skins and one of fox skins were held during the year at St. Louis, Mo.

Acknowledgement is made of valuable aid in the preparation of this report by Assistant Agent E. M. Ball, who compiled the statistics of the fisheries and prepared much of the accompanying text. Dr. G. Dallas Hanna assisted in the preparation of items regarding the Pribilof Islands.

REGULAR EMPLOYEES, ALASKA SERVICE.

During the year 1918, the following regular employees have been identified with the Alaska service of the Bureau:

REGULAR EMPLOYEES IDENTIFIED WITH THE ALASKA SERVICE IN 1918.

Name.	Position.	Headquarters or chief place of duty.
Ward T. Bower	Chief agent	Washington, D. C.
Edward M. Ball	Assistant agent	Kodiak.
Harry J. Christoffers	do	Seattle.
Ernest P. Walker	Inspector	Wrangell.
James H. Lyman	Assistant agent	Cordova. (Resigned Jan. 9, 1918, for military duty.)
Calvin F. Townsend	do	Fairbanks. (Promoted Dec. 16, 1918, from warden.)
Harry C. Fassett	Agent and caretaker	St. Paul Island.
A. H. Proctor	do	St. George Island.
Henry D. Aller	Storekeeper	Washington, D. C., and St. George Island. (Transferred July 10, 1918, from assistant.)
G. Dallas Hanna	do	St. Paul Island.
William T. Miles	Physician	St. George Island. (Resigned July 20, 1918.)
William B. Hunter	do	St. Paul Island. (Resigned Aug. 31, 1918.)
Charles E. Johnson	do	St. George Island. (Appointed July 21, 1918.)
Henry H. Stromberger	do	St. Paul Island. (Appointed Sept. 1, 1918.)
Arnold C. Reynolds	Assistant agent	St. Paul Island. (Promoted Mar. 1, 1918, from school teacher, St. George Island. Died Nov. 9, 1919.)
George Haley	School teacher	St. Paul Island.
Cora Giles Haley	do	Do.
Charles E. Crompton	do	St. George Island. (Promoted Mar. 1, 1918, from warden.)
Fred H. Gray	Warden	Wrangell.
Shirley A. Baker	do	Dillingham. (Resigned Oct. 14, 1918, for military duty.)
Christian L. Larson	do	Chicken.
Henry C. Scudder	do	Wrangell. (Resigned July 8, 1918, for military duty.)
Jesse L. Nevill	do	Wrangell. (Resigned Dec. 31, 1917.)
Lemuel G. Wingard	do	Cordova. (Appointed May 5, 1918.)
Elmer B. Mitchell	do	Wrangell. (Appointed July 25, 1918. Resigned Nov. 30, 1918.)
Michael J. O'Connor	do	Haines. (Appointed Sept. 1, 1918.)
Hans Bierd	Master steamer Roosevelt	Seattle.
Edwin Hofstad	Master steamer Osprey	Wrangell.
Albert K. Brown	Clerk	Washington, D. C.
Mary S. Haines	do	Do.
William P. Rasin	do	Do.
Marguerite McBride	do	Washington, D. C. (Appointed Jan. 17, 1918.)
E. Elaine Bell	do	Seattle.
Gladys M. Gamlen	do	Seattle. (Appointed Oct. 4, 1918.)

REGULAR EMPLOYEES AT GOVERNMENT HATCHERIES IN ALASKA IN 1918.

Name and location.	Position.
Afognak:	
Edwin Wentworth	Superintendent.
G. C. Robertson	Foreman. (Transferred July 31, 1918, to foreman, Clackamas, Oreg.)
Harry J. Heuver	Foreman. (Promoted Aug. 1, 1918, from fish-culturist, Nashua, N. H.)
Russell Noyes	Fish-culturist. (Promoted Jan. 16, 1918, from apprentice fish-culturist, same station.)
W. E. Sullivan	Fish-culturist. (Transferred Oct. 31, 1918, to fish-culturist, Baker Lake, Wash.)
Fred R. Lucas	Fish-culturist. (Promoted Jan. 1, 1918, from apprentice fish-culturist, Puget Sound stations. Promoted Nov. 16, 1918, from apprentice fish-culturist, same station.)
Albert L. Carlton	Apprentice fish-culturist. (Promoted Jan. 16, 1918, from apprentice fish-culturist, Puget Sound stations.)
Alfred Nelson	Apprentice fish-culturist.
F. J. Stewart	Cook.
McDonald Lake:	
Charles B. Grater	Superintendent. (Transferred Oct. 15, 1918, to superintendent, Leadville, Colo.)
C. H. Van Atta	Superintendent. (Promoted Oct. 16, 1918, from foreman, same station.)
Calvin D. Ryan	Foreman. (Promoted Oct. 16, 1918, from fish-culturist, Baker Lake, Wash.)

REGULAR EMPLOYEES AT GOVERNMENT HATCHERIES IN ALASKA—Continued.

Name and location.	Position.
McDonald Lake—Continued.	
Kenneth P. Hutton	Fish-culturist. (Transferred June 30, 1918, to assistant car messenger.)
C. N. Blystad	Fish-culturist. (Promoted Aug. 16, 1918, from apprentice fish-culturist, same station.)
J. H. Tierney	Fish-culturist.
Harry E. Leuenberger	Apprentice fish-culturist. (Promoted Feb. 16, 1918, from apprentice fish-culturist, Baker Lake, Wash. Resigned May 31, 1918, for military duty.)
William A. Cagle	Apprentice fish-culturist. (Promoted Aug. 1, 1918, from apprentice fish-culturist, Manchester, Iowa.)
Clarence B. Rivers	Apprentice fish-culturist. (Resigned May 31, 1918, for military service.)
Clive L. Henry	Apprentice fish-culturist. (Promoted Aug. 1, 1918, from apprentice fish-culturist, Clackamas, Oreg. Resigned Sept. 30, 1918, for military duty.)
Edwin F. Anderson	Apprentice fish-culturist. (Appointed Oct. 1, 1918. Resigned Nov. 20, 1918.)
M. T. Tierney	Cook.

Record is hereby made of the regular employees of the Alaska service who entered upon military duty during the year.

James H. Lyman, formerly assistant agent in the Alaska service, resigned January 9, 1918, to enlist in the aeronautical service. After several months at Kelly Field, San Antonio, Tex., Mr. Lyman was transferred to the Three hundred and twelfth Aero Squadron at Bolling Field, near Washington. He was later transferred to the Motor Transport Corps and on September 24 was commissioned as a second lieutenant.

Henry C. Scudder, warden in the Alaska service, resigned July 8 to enter military service. He was first stationed at Camp Lewis, Wash., and was subsequently sent to the officers' artillery training camp at Camp Taylor, Ky., where he had about completed the course when the armistice was signed November 11. Soon thereafter he was discharged from the Army, and on January 1, 1919, was reinstated in the position of warden at an increased salary.

Shirley A. Baker, warden in the Alaska service, resigned October 14 to enter military service. He was sent to Camp Lewis, Wash., where he was in training at the cessation of hostilities. He was later discharged from the Army and reentered the service of the Bureau on February 20, 1919, resuming his former position as warden in charge of the work in the Bristol Bay district.

FISHERY INDUSTRIES.

The Territory of Alaska is divided for the purposes of this report into three coastal geographic sections generally recognized as follows: Southeast Alaska, embracing all that narrow strip of mainland and the numerous adjacent islands from Portland Canal northwestward to and including Yakutat Bay; central Alaska, the region on the Pacific from Yakutat Bay westward, including Prince William Sound, Cook Inlet, Chignik, and Ikatan Bay; and western Alaska, the shores of Bering Sea and Kotzebue Sound, and the territory drained by rivers tributary thereto.

Detailed reports and statistical tables dealing with the various fishery industries are presented herewith, and there are also given the important features of certain subjects which were the object of special investigation or inquiry.

WATERS CLOSED TO COMMERCIAL FISHING.

Section 6 of the act approved June 26, 1906, for the protection and regulation of the fisheries of Alaska, is as follows:

SEC. 6. That the Secretary of Commerce may, in his discretion, set aside any streams or lakes as preserves for spawning grounds, in which fishing may be limited or entirely prohibited; and when, in his judgment, the results of fishing operations in any stream, or off the mouth thereof, indicate that the number of salmon taken is larger than the natural production of salmon in such stream, he is authorized to establish close seasons or to limit or prohibit fishing entirely for one year or more within such stream or within five hundred yards of the mouth thereof, so as to permit salmon to increase: *Provided, however*, That such power shall be exercised only after all persons interested shall be given a hearing, of which due notice must be given by publication; and where the interested parties are known to the Department they shall be personally notified by a notice mailed not less than thirty days previous to such hearing. No order made under this section shall be effective before the next calendar year after same is made: *And provided further*, That such limitations and prohibitions shall not apply to those engaged in catching salmon who keep such streams fully stocked with salmon by artificial propagation.

Pursuant to the provisions of this section, action was taken in 1918 in regard to the waters of southeastern Alaska, the Copper and Yukon Rivers.

Under date of June 12, 1918, announcement was made of a hearing to be held in respect to the Yukon River. The text of the announcement was as follows:

It having been recommended that the Secretary of Commerce limit or prohibit commercial fishing for salmon, or other commercial fishing in the prosecution of which salmon are taken or injured, in the Yukon River and its delta, and in all tributary waters in Alaska, notice is hereby given under the provisions of section 6 of the act of Congress approved June 26, 1906, entitled "An Act for the protection and regulation of the fisheries of Alaska," that a hearing to determine the advisability of limiting or prohibiting fishing operations in the above-named waters will be held at the office of the Bureau of Fisheries, 1217 L. C. Smith Building, Seattle, Wash., on November 20, 1918, at 10 o'clock a. m., at which time and place all persons interested will be heard.

Following the hearing on November 20, 1918, the Department under date of December 14, 1918, promulgated the following order:

A hearing having been given at Seattle, Wash., November 20, 1918, after due notice in accordance with law, for the purpose of determining the advisability of establishing a salmon-breeding reserve of certain waters in Alaska, and all persons having had full opportunity to be heard, it is hereby ordered, by virtue of the authority vested in me by section 6 of "An Act for the protection and regulation of the fisheries of Alaska," approved June 26, 1906, that until further notice all fishing for salmon or other fishing in the prosecution of which salmon are taken or injured, in the Yukon River and all tributary waters, and in all waters of its delta to and including the area 500 yards outside each mouth or slough of the delta at mean high tide, be and is hereby made subject to the following limitations and prohibitions in addition to the general restrictions already applicable by virtue of existing laws and regulations:

1. That in 1919, and in each year thereafter unless otherwise ordered in the manner prescribed by law, not to exceed 30,000 cases (forty-eight 1-pound cans per case, or the equivalent thereof) of canned salmon, 1,000 barrels (200 pounds net weight each) of pickled or hard-salted salmon, and 200 tierces (800 pounds net weight each) of mild-cured salmon, of all species, shall be prepared for commercial purposes or export; these quantities to be apportioned, after a conference with the local representative of the Bureau of Fisheries, as equitably as practicable among the persons or companies with established plants. Promptly at the end of each calendar week each individual or company shall submit a statement to the said representative of the Bureau of Fisheries showing the number of cases, barrels, and tierces of salmon thus prepared to date, and shall submit also a record of the number of salmon of each species taken daily.

2. That no salmon to be prepared by canning, pickling, or mild curing for shipment from Alaska shall be caught above the junction of the Clear River with the Yukon River near Andreafski.

3. That commercial fishing in the waters of the Yukon delta shall be limited to Kwikluak Pass, commonly known as the south mouth or channel.

4. That the use of traps or pound nets in the Yukon River and its delta is prohibited.

5. That no gill net, seine, or other net used in the Yukon River and its delta shall exceed 700 feet in length.

6. That all commercial fishing, except for local requirements, is prohibited after August 31 of each year.

This order becomes effective January 1, 1919.

Under date of September 16, 1918, announcement was made of a hearing to be held in respect to Copper River. The text of the announcement was as follows:

Whereas it has been recommended that the Secretary of Commerce amend the order of December 29, 1917, effective January 1, 1918, limiting fishing in the Copper River, Alaska, its delta, and its tributary waters, notice is hereby given under the provisions of section 6 of the act of Congress approved June 26, 1906, entitled "An Act for the protection and regulation of the fisheries of Alaska," that a hearing to determine the advisability of further limiting fishery operations or of modifying the existing limitations on such operations in the aforesaid waters will be held at the office of the Bureau of Fisheries, 1217 L. C. Smith Building, Seattle, Wash., on November 22, 1918, at 10 o'clock a. m., at which time and place all persons interested will be heard.

Following the hearing on November 22, 1918, the Department, under date of December 20, 1918, promulgated the following order:

A hearing having been given at Seattle, Wash., November 22, 1918, after due notice in accordance with law, for the purpose of determining the advisability of amending the order of December 29, 1917, effective January 1, 1918, establishing a salmon-breeding reserve and limiting fishing in the Copper River, Alaska, its delta and its tributary waters, and all persons having had full opportunity to be heard, it is hereby ordered, by virtue of the authority vested in me by section 6 of "An Act for the protection and regulation of the fisheries of Alaska," approved June 26, 1906, that until further notice all fishing for salmon or other fishing in the prosecution of which salmon are taken or injured, in the Copper River and its delta and all tributary waters, Alaska, be and is hereby made subject to the following limitations and prohibitions in addition to the general restrictions already applicable by virtue of existing laws and regulations:

1. Commercial fishing is prohibited in waters of the Copper River delta from 6 a. m. on January 1 to 6 a. m. on June 10 of each year, and in the waters of Miles Lake and Abercrombie Canyon from 6 a. m. on January 1 to 6 a. m. on June 15 of each year.

2. Commercial fishing in the waters of the delta shall be limited to set nets and drift gill nets. No such net shall exceed 800 feet in length. The lateral distance interval between all such nets in the waters of the delta herein referred to shall be not less than 600 feet.

3. All fishing is prohibited from the head of the delta to the foot of Miles Lake at all times.

4. All fishing in Miles Lake shall be limited to set nets. No such net shall exceed 800 feet in length, and only one such net shall be extended out from shore from one location. No offshore nets will be permitted in the lake. Throughout the fishing season the shore of the lake shall be considered as it was on June 15. The lateral distance interval between all nets in Miles Lake shall be not less than 600 feet. No fishing will be permitted along the west and north shores of Miles Lake from the north end of Mile 49 bridge to the north end of Miles Glacier, nor along the islands and sand bars between the bridge and the head of the lake.

5. Fishing in Abercrombie Canyon shall be restricted to the use of dip nets operated by hand, such nets not to exceed 16 inches in greatest diameter. No fishing will be permitted at any point on the east side of the canyon or river above the head of the lake.

6. No fishing will be permitted at any time in the waters of the Copper River above Abercrombie Canyon, or in any of the waters tributary thereto, except in the case of local residents, who may take limited numbers of salmon for domestic use: *Provided*, That such fishing shall at no time be upon the spawning grounds of any salmon.

7. No net shall be placed in any other than substantially a straight line.

8. For the purposes herein considered, the delta of the Copper River shall be regarded as including all waters south of an east and west line passing through Mile 27 on the Copper River & Northwestern Railway, as at present established, and inside of a line 500 yards off the mouth of each slough and outlet of the Copper River, beginning with Alaganik Slough on the west and ending with Gus Wilson Slough on the east, including Pete Dahl, Walhalla, Gus Stevenson, Little King Salmon, Castle, Storey, Big King Salmon (or Copper River proper), Duck, Russian, and all unnamed sloughs between. For the purposes of this order, the mouth of each slough will be regarded as at the edge of the grass banks at the line of mean high tide.

9. The lower end of Miles Lake shall be considered as at the bridge of the Copper River & Northwestern Railway at Mile 49. The head of Miles Lake shall be considered as at the point where the river enters the lake, this point to be as indicated by notices posted by duly authorized representatives of the Bureau of Fisheries.

10. Abercrombie Canyon shall be considered as extending from the head of Miles Lake to Tunnel Point on the Copper River & Northwestern Railway.

11. For the purposes of this order the following definitions are adopted: "Stake net," a gill net attached or affixed to piles or stakes. "Set net," an anchored gill net, one end of which may, if desirable, be fastened to a stake or other object on shore.

This order becomes effective January 1, 1919, and supersedes the order of December 29, 1917.

Under date of September 18, 1918, announcement was made of a hearing to be held in respect to the waters of southeastern Alaska. The announcement was as follows:

It having been recommended that the Secretary of Commerce limit or prohibit commercial fishing for salmon and other commercial fishing in the prosecution of which salmon are taken or injured, in all streams less than 500 feet in width in southeastern Alaska, east of the longitude of Cape Spencer, and in all lakes and other waters tributary to such streams and within 500 yards of the mouths of such streams, notice is hereby given under the provisions of section 6 of the act of Congress approved June 26, 1906, entitled "An Act for the protection and regulation of the fisheries of Alaska," that a hearing to determine the advisability of limiting or prohibiting fishing operations in the above-described waters will be held at the office of the Bureau of Fisheries, 1217 L. C. Smith Building, Seattle, Wash., on November 25, 1918, at 10 o'clock a. m., at which time and place all persons interested will be heard.

Following the hearing on November 25, 1918, the Department, under date of December 21, 1918, promulgated the following order:

A hearing having been given at Seattle, Wash., November 25, 1918, after due notice in accordance with law, for the purpose of determining the advisability of making salmon-breeding reserves of certain waters in Alaska, and all persons having had full opportunity to be heard, it is hereby ordered, by virtue of the authority vested in me by section 6 of "An Act for the protection and regulation of the fisheries of Alaska," approved June 26, 1906, that until further notice all fishing for salmon, or other fishing in the prosecution of which salmon are taken or injured, in all hereinafter-described waters of southeastern Alaska east of the longitude of Cape Spencer, be and is hereby made subject to the following limitations and prohibitions, in addition to the general restrictions already applicable by virtue of existing laws and regulations:

1. That fishing with all forms of apparatus is prohibited in all streams less than 500 feet in width at the mouth at mean low tide and in all lakes and other waters tributary to such streams.

2. That all fishing with purse seines and drift gill nets and all other movable fishing appliances, other than set nets and beach seines, is prohibited within 200 yards outside the mouth at mean low tide of all streams less than 500 feet in width at their mouth, except at the mouths of the Chilkat and Chilkoot Rivers, where the prohibited distance for all fishing appliances shall be 500 yards.

3. That all fishing with traps, stake nets, and other fixed fishing appliances, and set nets and beach seines is prohibited within 500 yards outside of the mouth at mean low tide of all streams less than 500 feet in width at their mouth. No exceptions will be made in favor of any fixed fishing appliances heretofore operated within the prohibited areas.

4. That the driving of salmon downstream and the causing of salmon to move outside the protected area at the mouth of any stream are expressly prohibited.

5. That this order does not supersede but supplements sections 3 and 4 of the order promulgated by the Secretary of Commerce on November 18, 1912, which, respectively, prohibit all commercial fishing for salmon or other fishing in the prosecution of which salmon are taken or injured "in Anan or Humpback Creek, its lagoon, lakes, and tributary waters, together with the region within 500 yards of the mouth of said creek," and "in Naha stream, its lagoon, lakes, and tributary waters, above a line connecting the points known, respectively, as Loring Point and House Point." Likewise this order does not supersede but supplements the order promulgated by the Secretary of Commerce on October 25, 1915, which similarly prohibits fishing (*a*) "in all waters tributary to Barnes Lake, Prince of Wales Island," (*b*) "in Hetta Creek, its tributary waters, and the region within 500 yards of the mouth of said creek," and (*c*) "in Sockeye Creek, its tributary Boca de Quadra hatchery waters, and the region within 500 yards of the mouth of said creek."

This order becomes effective January 1, 1919.

Limitations and prohibitions upon fishing in the following waters are applicable by virtue of previous orders of the Secretary of Commerce: In western Alaska, Wood and Nushagak Rivers; and in central Alaska, all streams flowing into Cook Inlet, Eyak Lake, and a limitation upon fishing in Eyak River. Limitations have been placed upon fishing by Executive order and proclamation in the following additional waters: Afognak Reservation, Aleutian Islands Reservation, Yes Bay and Stream, and the Annette Island Fishery Reserve.

STREAM IMPROVEMENT.

The work inaugurated a few years ago of removing obstructions in salmon streams received some attention in 1918 in southeastern Alaska. The streams which were opened were Anan and Whitney Creeks on Wrangell Island and Olive Creek on Etolin Island. Some log jams were removed from the upper Chilkoot River and the falls in Mill Creek near Wrangell were reduced sufficiently for salmon to ascend. It is reported that beneficial results have already been noted.

The importance of this work is obvious, and it is planned that in time, as funds and facilities permit, all streams in Alaska which were once open to salmon will be cleared of débris and log jams and be

restored to their former condition. The scope of these operations will be extended to include the opening of streams which, because of falls or other natural obstructions, have never been accessible to salmon. The possibilities of the work are most important in providing additional spawning grounds, thus materially aiding in restoring and maintaining the supply of salmon. Normally, the greater the spawning areas of a given section the greater will be the run of salmon.

STREAM WATCHMEN.

The Bureau has given consideration from time to time to the need of a closer patrol of the fisheries of Alaska to prevent destructive fishing, encroachment upon streams, and the continuance of operations during close seasons. In the past, this work has been seriously hampered by a lack of funds and personnel, but in 1918 additional assistance was secured by the temporary employment of 10 men as stream watchmen, most of whom were connected with the University of Washington, either in a professorial capacity or as students. Five of these men were assigned to duty in southeastern Alaska, while the other five were detailed to localities in central Alaska.

Specific assignments for duty were as follows: Central Alaska—Kenneth Cole, at Katalla; Claude V. O'Callaghan, at Latouche, to cover the western part of Prince William Sound; Edward G. Cox, at Cordova, to patrol the eastern part of Prince William Sound and Copper River delta; Jason J. Perry and Francis W. Perry, at Miles Lake and Abercrombie Canyon; and southeastern Alaska—Ernest F. Goodner, at Anan Bay; Clifford J. Mattox, at Karta Bay; James M. Hay, at Lake Bay; E. O. Eckelman, on patrol duty on the Bureau's steamer *Osprey;* and M. J. O'Connor, at Chilkoot. Mr. O'Connor was later transferred to the regular service as a warden.

Much good resulted from this increase of the patrol force in the enforcement of the laws and regulations as well as in the prevention of unlawful acts in connection with the fisheries. Further benefits were obtained in the collection of data for the information and use of the Bureau. It is contemplated that this work will be extended from year to year, as funds permit, until an adequate patrol force is secured.

ALASKA FISHERY INTELLIGENCE SERVICE.

In 1917 there was put into effect jointly by the Bureau of Fisheries and the Washington-Alaska Military Cable & Telegraph System an intelligence service to communicate by telegraph to various coastal towns in Alaska the daily prices of certain species of fish offered at Seattle and Ketchikan, thus giving fishermen an opportunity of marketing their product under the most favorable conditions.

This service has been continued through 1918 and has no doubt been of genuine benefit. Prices are not necessarily telegraphed each day, as it frequently happens that there are no quotations. The figures, as received at Juneau, Petersburg, Wrangell, Ketchikan, Sitka, Skagway, Valdez, Seward, and Cordova, are posted at the telegraph offices. In some instances local papers have given these figures a place in their regular news columns.

The figures are secured by representatives of the Bureau. It is the desire to continue the service.

SALMON STREAM, KUPREANOF ISLAND, SOUTHEAST ALASKA, SHOWING WORK OF STREAM IMPROVEMENT. THE STEP AT RIGHT WAS BLASTED OUT IN ORDER TO PERMIT ASCENT OF SALMON.

FISHERY PATROL BOAT, SOUTHEAST ALASKA.

PATROL BOATS.

The enforcement of the fisheries laws and regulations of Alaska is contingent upon the ability of those charged with such duties to cover the territory regularly during the fishing season. This can be done most effectively by furnishing each man with a boat. Since the Bureau has but three vessels of its own for this work, it is necessary to hire each season several small boats for limited use in certain important localities. This was done to a greater extent in 1918 than ever before, owing to the employment of several men as stream watchmen.

In southeastern Alaska the Bureau's steamer *Osprey* and the motor vessels *Murre* and *Auklet* were regularly engaged in patrol work during the season. In addition, four small launches, namely, *My Fancy*, *Kitty*, *Bee*, and *May*, were chartered at various times. In central Alaska the motor boats *Prospector* (7 tons net), *Ellona*, and five small unnamed power boats were chartered at different times, some being used continuously for several weeks while others were used for single trips of but a few days. They were engaged chiefly in the Copper River and Prince William Sound districts.

The packing companies furnished free transportation to representatives of the Bureau on several occasions when other facilities were not available.

The installation of hot-water heating plants on the *Murre* and *Auklet* was completed at Juneau in February, 1918, at a cost of $1,044 for both vessels. In the fall of 1918 the galleys on these boats were enlarged. This adds greatly to the comfort of persons whose duties take them aboard these boats.

On September 12, the *Auklet* was struck by the Canadian Pacific liner *Princess Sophia* while at the dock at Juneau. The house was considerably damaged, although the hull was not injured. Repairs were made without expense to the Bureau.

The *Osprey*, *Murre*, and *Auklet* were engaged for several weeks the latter part of October and most of November in searching for bodies from the *Princess Sophia*, which vessel was wrecked October 25, on Vanderbilt Reef with a loss of 343 lives, no one on board being saved.

In July, the launch *Swan* was put in commission on the Yukon River. This boat was built in the previous winter at Fairbanks. It is of a type specially adapted to river use. It is 36 feet in length by 6 feet in beam, and is equipped with a 20-horsepower motor. On trial tests, a speed of 6 miles per hour was developed upstream against a current 4½ miles an hour, and 13 miles per hour downstream. Fuel consumption was 2½ gallons per hour. Arrangements have been made with the War Department to secure fuel at military posts. There are sleeping accommodations for two persons on the *Swan*.

In a report submitted in the fall of 1918 by Warden Shirley A. Baker, attention was drawn to the need of a staunch, seaworthy, patrol vessel, to be at the disposal of the Bureau's representatives covering the Bering Sea cannery district. It was recommended that this vessel should be at least 50 feet in length and equipped with nothing less than a 40-horsepower Pacific coast make of heavy-duty engine. Cannery operations are being extended every year and to cover the different regions and to make any inspection of real conse-

quence requires the use of a strong, comfortable vessel with a cruising radius of several hundred miles. Warden Baker has also directed attention to the need of a strong, seaworthy launch, about 32 or 35 feet long, with a medium heavy-duty engine of 10 horsepower or more. This launch should not draw more than 2½ feet of water, as it is needed primarily for the patrol maintained in connection with the Nushagak and Wood Rivers, which are closed to commercial fishing.

In connection with the matter of patrol boats, it is of interest to quote the following from a recent general report by Assistant Agent Ball:

> The great need of the service is boats and men in sufficient number to permit the placing of one at each important fishing district. As the patrol is increased, the size of the district given to each man will be reduced until it reaches a point where very good control of fishing activities can be maintained. To give anything like adequate protection to the fisheries of the Copper River and the enforcement of the law in that district, the Bureau should have three boats of the size and type of the one it now has on the Yukon. Such boats would have the requisite speed and also be sufficiently seaworthy, as it would never be necessary to take them into open waters. While storms may occur occasionally it is always possible for small boats to find shelter in any one of the many sloughs and outlets of the river.
>
> Proper patrol and protection of the Cook Inlet district would require three similar boats for use north of Ninilchik, where the water is very muddy and the shores are strewn with numerous bowlders. The advantage in having shallow draft boats in these waters would be that they could enter practically any of the streams flowing into the inlet in event of a storm, whereas boats drawing 3 or 4 feet of water could find no safe anchorage north of Kachemak Bay except in the Kasilof and Kenai Rivers. Full-powered seagoing launches would be required for the lower inlet, Prince William Sound, Kodiak, and all other localities in the central district as in them the waters are deep, more exposed, and visited by frequent wind storms. With the constantly increasing development of the fisheries, this need becomes more urgent, for with the demand for fish becoming greater and commerical competition becoming keener there will also grow a tendency to disregard the laws until permanent injury to the fisheries will result.

VIOLATIONS OF LAWS AND REGULATIONS.

On December 9, 1918, the Supreme Court of the United States delivered an opinion confirming the opinion of the circuit court of appeals for the ninth circuit enjoining the Alaska Pacific Fisheries from maintaining, and compelling it to remove, a fish trap erected by it in Annette Island waters, Alaska.

A case of interest to packers in general was brought on May 23, 1918, by the United States attorney at Valdez against the Pioneer Packing Co. for the nonpayment of a license tax, an information being filed in the district court at Valdez alleging that the Pioneer Packing Co. did prosecute unlawfully the business of manufacturing without first having obtained a license from the clerk of the district court. Counsel for the defendant interposed a demurrer, which was overruled by Judge Fred M. Brown on May 28, 1918. At the October, 1918, term of the district court the case was again taken up, when the defendant refused to plead further. On October 16 a fine of $500 was imposed. The company has one year from that date in which to appeal. Under the law a license tax of $500 was assessed against the Pioneer Packing Co. for the operation of a clam cannery at Cordova, Alaska, as a manufactory doing a certain volume of business. The law further provides that if the tax is not paid when due, the company upon conviction shall pay a fine equal to the amount of the tax,

which in this case was $500, or a total of $1,000 that must be paid. This action is final, unless the circuit court of appeals, to which the case may be taken, reverses the judgment of the lower court.

The Abercrombie Packing Co. was tried in the United States commissioner's court at Cordova on July 1 for having fished at six places in Miles Lake in June, 1918, with gill nets set less than 600 feet apart, and for fishing in Abercrombie Canyon at two points on the east bank of the Copper River at intervals of less than 300 feet, all in violation of the regulations of December 29, 1917. A plea of guilty was entered on all complaints and a fine of $500 was paid. In October the grand jury at Valdez returned a true bill against the Abercrombie Packing Co. on four counts involving violations of the order of December 29, 1917, by the use of set nets in Miles Lake in June, 1918, at less than 600 feet apart. The Northwestern Fisheries Co. and the Canoe Pass Packing Co. were also indicted jointly on four counts for similar offenses.

The Carlisle Packing Co. was indicted in October on three counts for the operation between Mountain Slough and Cape Whitshed of three fishing appliances, each consisting of two distinct traps having their complement of parts, the lead of one being attached to the pot of the other, in total disregard of the endwise distance interval of 100 yards required by law. The Canoe Pass Packing Co. was indicted for the operation of a similar appliance.

On July 10 the Northwestern Fisheries Co. and the Canoe Pass Packing Co. were tried for wanton waste of salmon at Miles Lake on June 20. Pleas of guilty were entered, and each company was fined $200 and costs. Tom Teets was tried for a similar offense, but was acquitted.

The Valdez Packing Co. was tried and convicted on August 14 before the United States commissioner at Cordova, on a charge of having permitted two traps in Fidalgo Bay to fish during the weekly close period of July 13 and 14. A fine of $500 was imposed for each trap. The watchman at each trap was also tried and fined $100. The cases were appealed. Settlement was finally effected at Valdez on September 27, when the case was heard informally by Judge Bunnell. The company, after being convicted of the offense charged in the United States commissioner's court at Cordova, now pleaded guilty and secured a reduction of the fine from $500 to $100 for each trap. The fines imposed by the lower court against the watchmen were waived, and the case against them was dismissed.

On August 22 the Copper River Packing Co. was tried before the United States commissioner at Valdez for failure to close two of its traps in Fidalgo Bay on Sunday, July 28. The case was prosecuted before a jury which returned a verdict of guilty, whereupon a fine of $400 for both traps was imposed. The complaint also named the trap watchmen as codefendants, but prosecutions were not made.

On September 3 three complaints were filed before the United States commissioner at Kodiak against the Alitak Packing Co., charging it with (1) wanton waste of salmon, (2) canning salmon that had been killed more than 48 hours, and (3) constructing and operating a trap in Moser Bay within 600 yards laterally of another trap. On the same day warrants were served on F. A. Davidson, superintendent of the Alitak Packing Co.'s cannery at Lazy Bay, who upon

being arraigned pleaded guilty to the first two complaints, while a plea of not guilty was entered in respect to the third complaint. Two cases were disposed of at this time by the imposition of a fine of $200 for each and the costs, which amounted to $57. The third case was called for trial on September 20 at Alitak, and resulted in a conviction of the company, which was fined $1,000 and assessed the costs of the prosecution, amounting to more than $500. The case was appealed to the district court.

On September 21 a complaint was filed before the United States commissioner at Alitak against the Alaska Packers Association for the construction of a fish trap in Moser Bay within the prohibited distance of another trap. The case was tried immediately and resulted in a conviction. A fine of $1,000 and costs was imposed. An appeal was taken.

In February, 1918, the grand jury at Juneau returned a true bill against R. E. Voeth for fishing the latter part of August, 1917, with nets covering more than one-third the width of the principal stream entering Anita Bay, Etolin Island. The grand jury also returned a true bill against Sergis Williams, Charles Daniels, Nicholas Keene, John Cameron, and John Williams, all natives, for the wanton waste of herring at Sitka in April, 1917. An instructed verdict of not guilty was returned in the case against Cameron and Williams, while a similar verdict was found after due trial for the other defendants.

On July 9, 1918, Peter Iverson, Ole Skaaner, J. Hesnes, Olaf Olson, and John Mjiord were discovered in the act of laying a purse seine in the waters of the Anan Reservation. Complaints were filed against them before the United States commissioner at Wrangell on September 22, and within two weeks all were apprehended. They pleaded guilty and each was fined $25.

On August 1 nine gill nets were found fishing in Chilkoot Inlet within less than 100 yards of each other. Action was brought against 16 natives for these offenses in the commissioner's court at Haines. Four of them, Harry Williams, Charlie Williams, Archie Watson, and Ben Watson, were operating for the Haines Packing Co. They pleaded guilty and were each fined $5 and costs. The remaining 12 men were fishing for the Alaska Pacific Fisheries. The cases against four of these men were dismissed. Five of them, George Jackson, Sam Andrews, David Perrin, Charley James, and Jim Willard, pleaded guilty and each paid a fine of $5 and costs. The other three, Patsy Davis, Ben Fox, and Fritz Willard, pleaded not guilty and their cases were continued until the district court convened at Juneau in September. At that time the matter was presented to the grand jury and true bills were returned against Fox and Davis. These men were arraigned on September 28 and pleaded guilty, whereupon each was fined $10 and costs. Fritz Willard was not indicted.

On Sunday, August 4, four traps, three in Tebenkoff Bay and one in Gedney Harbor, belonging to the Alaska Herring & Sardine Co., were found fishing. Complaint was entered before the United States commissioner at Juneau on August 7. The company pleaded guilty and was fined $500.

On August 8 complaint was filed against the Juneau Cold Storage Co. and Louis Carsten for fishing with a trap in Lynn Canal on Sunday, July 21. The company, upon pleading guilty, was fined $100, and the trap watchman was fined $50.

H. Bergman was tried on August 9 before the United States commissioner at Ketchikan for failure to close, in accordance with law, his trap at Seal Cove on August 4, during the weekly close period. He pleaded guilty and was fined $10.

James Willard, a native, was indicted for fishing in Chilkoot River on August 16 with a gill net covering more than one-third the width of the river. He was also indicted for improper conduct toward a civil officer of the Government in the discharge of his duties. On September 28 Willard pleaded guilty to the charge of illegal fishing and was fined $10 and costs amounting to more than $100. On account of the fine and heavy assessment of costs it was considered that this native was already sufficiently punished, and it was agreed by the Bureau's representative that the other charge be dismissed.

On September 4 the grand jury at Juneau indicted A. Rasmussen, Ben Larson, Nesle Running, Tom Carlson, and Arnold Sorsett for fishing in a stream tributary to Mole Harbor for a distance of more than one-third the width of the stream. On the 19th of the month Running and Sorsett appeared in court and pleaded guilty, being fined $25 each and the costs. The other three men had left Alaska and have not yet been brought to trial.

The grand jury returned a true bill against the Hoonah Packing Co. for failure to close its trap at Point Adolphus during the weekly close season on September 8. The case came to trial on September 18. The company pleaded guilty and explained that the watchman had stated he lost track of the days. A fine of $50 was imposed, this being the company's first offense.

The Thlinket Packing Co. was indicted at Juneau for the operation of a trap in Icy Strait west of Point Couverdeen during the weekly close season on Saturday, September 7. The case was called for trial on September 19, when the company pleaded guilty and was fined $50 and costs.

On Sunday, September 8, a trap belonging to the Alaska Pacific Fisheries in South Inian Pass was fishing during the weekly close period. Later in the month when the matter was presented to the grand jury it returned a true bill. The case came to trial on September 20, when a plea of guilty was entered and a fine of $50 and costs was imposed.

The grand jury at Juneau returned an indictment in October, 1918, against the Alaska Pacific Fisheries involving 15 counts for failure to properly close several of its fish traps during the weekly close season on various dates in July and August, 1918. This matter is still pending.

The case against the Alaska Pacific Fisheries, alleging that on or about August 15, 1917, the company installed a floating trap within less than 600 yards of a trap then in operation by the Thlinket Packing Co., near Village Point, has not been tried.

On Sunday, September 1, three traps of the Alaska Pacific Fisheries, located near Point Sherman, on the east shore of Lynn Canal, were found only partially closed, so that they were fishing at the lower stages of the water. The company was indicted and on September 19 pleaded guilty and paid a fine of $50 and costs.

Two prosecutions for stealing fish from traps occurred in southeastern Alaska. On September 6 an indictment for larceny was

returned at Juneau against Ike Weathers, Al Weathers, and F. C. Wright for robbing the Tee Harbor Packing Co.'s trap on Admiralty Island, south of Point Retreat, on the night of July 18, 1918. During the trial the charge against Wright, who was a trap watchman, was dismissed for lack of conclusive evidence connecting him with the crime, and he was used as a witness. It could not be clearly established that the men arrested were the persons who had robbed the trap, and a verdict of not guilty was returned. The second case was that against Herman Brandies and Louis Bolick, who were indicted on January 24, 1919, at Ketchikan for participating in the robbery of a trap of the J. L. Smiley Co., located at Bostwick Inlet, Gravina Island, on August 17, 1918. The charge was for embezzlement and fraudulent conversion of property. They were permitted to enter pleas of guilty of simple larceny and were sentenced to imprisonment for six months and one day.

On May 25 Anton Johanson was charged in a complaint filed before the United States commissioner at Franklin with fishing with gill nets in Eagle Creek, a stream less than 300 feet in width, between the hours of 6 p. m. and 6 a. m. of the following day, and also during the weekly close season. A plea of guilty was entered and a fine of $25 was paid. Subsequently the fine was remitted on account of the insufficiency of the complaint in stating the offense.

TERRITORIAL LICENSE TAX.

The territorial revenue act of May 3, 1917, imposes a tax on salmon canneries of 4½ cents per case on kings and reds, 2½ cents per case on medium reds, and 2 cents per case on all others; salteries, 2½ cents per 100 pounds on all fish salted or mild-cured, except herring; fish traps, fixed or floating, $100 per annum; and on cold-storage plants a graduated tax, according to the amount of business transacted. The following statement shows the tax collections made by the Territory during the calendar year 1918:

TERRITORIAL FISHERY LICENSE TAXES COLLECTED FOR THE YEAR ENDING DEC. 31, 1918.

Schedule.	Division No. 1.	Division No. 2.	Division No. 3.	Total.
Canneries	$73,823.86	$487.23	$123,239.45	$197,550.54
Salteries	1,209.38	.60	3,271.96	4,481.94
Fish traps	42,500.00	100.00	18,400.00	61,000.00
Cold-storage plants	1,550.00		500.00	2,050.00
Total	119,083.24	587.83	145,411.41	265,082.48

Information was received from the Territorial treasurer that in addition to the foregoing amount the sum of $6,730.35 was collected under the schedules imposing a tax upon fish-oil works and fertilizer and fish-meal plants using herring in whole or in part. This amount and $10,298 similarly collected for the year ending December 31, 1917, are being held on special deposit pending the settlement of litigation regarding these schedules.

CANADIAN-AMERICAN FISHERY CONFERENCE.

Matters affecting the fisheries of Alaska were taken under advisement at sessions of the Canadian-American Fishery Conference. The members in behalf of Canada were Hon. J. Douglas Hazen, Chief Justice of New Brunswick and former Minister of Marine and Fisheries; George J. Desbarats, Deputy Minister of Naval Service; and William A. Found, Superintendent of Fisheries. The American members of the conference were Hon. William C. Redfield, Secretary of Commerce; Hon. Edwin F. Sweet, Assistant Secretary of Commerce; and Dr. Hugh M. Smith, Commissioner of Fisheries. Sessions were held at Seattle on April 24 and 25, at Prince Rupert on April 30, at Ketchikan on May 2, at Vancouver on May 7, at New Westminster on May 8, and at Seattle again on May 9 and 10.

Among the subjects considered were the Alaska-British Columbia halibut controversy, the protection of halibut on the Pacific coast, the mutual use of American and Canadian ports by the fishing vessels of both countries, and the regulation of the Pacific whale fishery. Subsequent sessions were held at Ottawa on May 20 and at Lake Champlain September 4 to 6. The findings and recommendations of the conference have been submitted to the respective governments for appropriate action on the questions under consideration.

A preliminary result of the action of the conference, as an emergency war measure and to avoid restrictions upon the production of food, was the granting to fishing vessels of each nation of reciprocal port privileges, which included the right of vessels to discharge fares and clear again direct for the high seas. A few Canadian fares of halibut have been landed at American ports, while there have been numerous fares caught on offshore Alaskan banks by American vessels and landed at Prince Rupert. Action also has been taken resulting in the abrogation of the requirement that Canadian fishing vessels passing through American waters en route to fishing grounds on the high seas shall enter and clear at an American port.

UNITED STATES FOOD ADMINISTRATION.

By virtue of the act of Congress approved August 10, 1917, the United States Food Administration was created, its organization being extended to Alaska as well as to the several States. Under the terms of the presidential proclamation of January 10, 1918, all salt-water fishermen not previously licensed by the United States Food Administration, whether fishing independently or on shares or engaged at any period of the year in the commercial distribution, including catching and selling of any or all varieties of salt-water fish and all shellfish and crustaceans, were required to secure on or before February 15, 1918, a license to be issued under prescribed rules and regulations. Also those engaged in the business of canning salmon or sardines, not previously licensed, whose gross production was more than 500 cases per annum, except home canners and certain canning clubs recognized by the Department of Agriculture, were required to secure licenses. All licenses were issued by the United States Food Administration at Washington, D. C. Applicants for salmon cannery licenses were required to show to the satisfaction of the Food Administration that there was a supply of fish in

excess of the quantity then being utilized by the plants in operation, and that production would be increased by the amount of their packs. It was contrary to the policy of the Food Administration to grant a license for the operation of additional canneries where it simply meant a division of the supply of salmon without probable increase of production. Important considerations in this connection also were the conservation of labor, material, and supplies, particularly of tinplate.

The representatives of the Food Administration in Alaska, Washington, Oregon, and California met in Portland and Seattle in February, 1918, to take up chiefly the matter of licensing canneries and fixing the prices of salmon. Subsequently the United States Food Administration, acting upon the recommendation of Pacific-coast administrators, fixed the prices to be paid fishermen for raw fish. These prices varied for the different districts of Alaska, being made to meet local conditions.

The fixing of prices governing the sale of canned salmon, and action in respect to withdrawals of most of the pack in 1918 for military uses, received attention at the hands of the Food Administration. Following the cessation of hostilities, licenses, restrictions, and other requirements of the Food Administration were removed early in 1919.

Among those interested in the canning industry in Alaska who were more prominently identified with the activities of the Food Administration and who were connected with it were Messrs. Frank M. Warren, of the Alaska-Portland Packers' Association, E. B. Deming, of the Pacific American Fisheries, Dan Campbell, of the Astoria and Puget Sound Canning Co., and August Buschmann, of the Deep Sea Salmon Co. The food administrator for Alaska was Judge Royal A. Gunnison, following whose death Mr. P. R. Bradley was appointed. All of these gentlemen rendered great and valuable service, ably handling the many arduous and troublesome duties requiring their attention.

INQUIRY BY FEDERAL TRADE COMMISSION.

As part of a comprehensive investigation of food-producing industries undertaken by direction of the President, the Federal Trade Commission conducted an inquiry in 1918 in regard to the production and distribution of canned salmon. In December, 1918, the results of the inquiry were published by the commission.[a] It is stated that the report is based practically upon complete returns from all the salmon canners in the United States, including Alaska. Following a general description of the salmon-canning industry, including references to history, species of salmon, and methods of selling and distribution, general chapters are devoted to the consumption and production of canned salmon; the cost of packing and marketing; the prices of canned salmon, including particular reference to opening prices, and brokers' prices; capacity, investment, and profits; organization and control; legislation to protect the supply of salmon, and suggestions for the improvement of conditions in the salmon-canning industry.

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[a] Report of the Federal Trade Commission on Canned Foods. Canned Salmon. December, 1918. Washington, 1919.

Among the recommendations made by the Federal Trade Commission are the following:

That the Bureau of Fisheries have control of the salmon fisheries of Alaska in the interest of good administration and for the prevention of any possible monopoly in the future.

That licenses to trap locations should not run for more than five years, but that renewal thereof should be allowed; and further, that a trap location should not be allowed to remain in the possession of anyone, unless he makes use of it for at least three years during such five-year term.

That some department of the Government should furnish information which would facilitate a more direct marketing by salmon canners, so as to limit the payment of sub-brokerage.

That the announcement of an opening price is dangerous, and, as at present conducted, should be discontinued.

That "S. A. P. sales" (sales subject to the opening price) should be restricted.

WAIVING OF ALASKA EIGHT-HOUR LAW.

As a result of recommendations by the Bureau communicated through the Secretary of Commerce and the Secretary of the Interior, the Governor of Alaska, in exercise of the discretionary power conferred upon him by the legislature, issued a proclamation on December 15, 1917, suspending the restrictions of the eight-hour law as applying to salmon fisheries and canning or other preparation of salmon for food, and manufacturing industries whose products are necessary for the proper preparation of salmon as a food supply. The suspension became effective January 1, 1918.

On January 7, 1918, the governor issued another proclamation, immediately effective, suspending the operation of the Alaska eight-hour law so far as it affected the taking, preparing, and curing of halibut, herring, cod, and all other kinds of food fish in Alaskan waters, including the taking, preparing, and canning of clams and other shellfish.

A further waiving of the Alaska eight-hour law occurred on April 5, 1918, when the governor suspended its operation in respect to the manufacture of fertilizer, oil, and other by-products from the waste of the food fish industry in Alaska. The necessity of this action was not given consideration at the time of issuance of the previous proclamations.

The suspensions of law by virtue of these proclamations were intended to apply during the period of the war.

SUSPENSION OF NAVIGATION LAWS.

In February, 1918, the Secretary of Commerce, with the President's approval, issued certain instructions to collectors of customs with the object of facilitating landings of fish at American ports by foreign vessels. This action, which had bearing on the fisheries of Alaska, was an emergency war measure which under normal conditions could not be effective without appropriate legislation. The instructions were as follows:

To promote the vigorous prosecution of the war and to make the utmost use jointly of all the resources of the nations now cooperating, you will permit, during the war, Canadian fishing vessels and those of other nations now acting with the United States to enter from and clear for the high seas and the fisheries, disposing of their catch and taking on supplies, stores, etc., under supervision as in the case of merchant vessels entering and clearing for foreign ports, except as to tonnage tax and other charges specifically imposed on entry from and clearance for foreign ports.

WOOD RIVER CENSUS.

The usual count of red salmon entering Lake Aleknagik on Wood River, Alaska, was made in 1918. The work was under the direction of Warden Shirley A. Baker, assisted by Fred R. Lucas, who was temporarily detached from the Afognak fish-cultural station.

Continuing the custom of past seasons, a rack consisting of cotton trap webbing hung on piling and weighted with chains was placed across the lower end of the lake in the latter part of June. Counting of salmon began June 28 and was carried on daily until August 5, a period of 39 days.

The run of salmon began somewhat later than usual. This was attributed to the late breaking of winter, there being an ice gorge in the Bristol Bay region which could not be penetrated until almost the end of May. During the season, however, the weather was extraordinarily fine with little or no rain or wind. It is said that these conditions caused the salmon to linger in the waters of the bays until nearly ready to spawn, when heavy rushes were made up the rivers. The run of red salmon appears to have been the largest of record although the count into Lake Aleknagik was less by 138,306 than in 1917.

The first considerable count of salmon passing through the rack was made on July 10, when 28,302 were admitted to the lake. On the following day, July 11, the count increased to 131,156, which number was exceeded but once during the season, on July 18, when 235,700 passed into the lake. There were only six days which show a count of more than 50,000 salmon each, on four of which the count was in excess of 100,000. The tally for the season was 943,202, the details of which are given in the following table:

WOOD RIVER SALMON CENSUS IN 1918.

Date.	Number.	Date.	Number.	Date.	Number.
June 28	14	July 12	102,042	July 26	1,258
29	9	13	55,478	27	646
30	33	14	35,159	28	868
July 1	258	15	29,328	29	324
2	462	16	43,155	30	388
3	568	17	124,038	31	596
4	1,440	18	235,700	Aug. 1	515
5	1,223	19	78,902	2	773
6	1,511	20	36,507	3	308
7	1,821	21	7,321	4	417
8	3,370	22	2,416	5	208
9	7,451	23	4,646		
10	28,302	24	3,236	Total	943,202
11	131,156	25	1,355		

It was reported that less than 20 king salmon entered Lake Aleknagik. Humpback salmon were also scarce, but there was an appreciable run of chum salmon.

Valuable assistance in the installation of the rack and in making the count of salmon was generously given by the Alaska Packers Association and the Alaska-Portland Packers' Association.

ALEUTIAN ISLANDS RESERVATION.

The administration of the Aleutian Islands Reservation, which was created by Executive order of March 3, 1913, is under the joint control of the Department of Commerce and the Department of Agriculture. By the terms of the joint regulations issued by these two departments effective March 15, 1914, no one may carry on any line of business within the reservation without first securing a permit to do so.

In the exercise of its authority by virtue of the terms of the Executive order establishing the reservation, the Department of Commerce issued 11 fishery permits in 1918, 2 of which, granted to the Alaska Commercial Co. and O. K. Quean, respectively, expired December 31, 1918. There are also 12 permits of those issued prior to 1918 which remain effective, making a total of 21 permits outstanding at the end of the calendar year 1918. Informal permission was granted to Mark Morris, of Unalaska, on July 28, 1915, to engage in fishery operations for supplying local needs.

PERMITS FOR FISHERY OPERATIONS IN ALEUTIAN ISLANDS RESERVATION EFFECTIVE AT END OF CALENDAR YEAR 1918.

No.	Date.	Grantee.	Location and scope of operations.
4	Mar. 5,1915	A. B. Somerville	Attu Island. To take and sell red salmon either fresh or salted. Extended Sept. 7, 1915, to include atka mackerel.
6	Jan. 15,1916	Pacific American Fisheries	Unalaska Island. Salmon cannery.
7	June 28,1916	Union Fish Co	Tigalda Island. Cod station.
10	Dec. 9,1916	Pacific American Fisheries	Unimak Island. Salmon cannery.
11	Dec. 11,1916	Sockeye Salmon Co	Do.
12	Jan. 4,1917	Paul Buckley	Akutan Island. Codfish station.
18	June 22,1917	Andrew C. Smith	Chernofski Harbor and Kuliliak Bay, Unalaska Island. Salting cod and salmon.
19	Aug. 8,1917	Alaska Commercial Co	Preserving cod and salmon within the reservation; erection of cannery prohibited.
20	Sept. 19,1917	Umnak Livestock Co	Nikolski, Umnak Island. Preserving cod and salmon; erection of cannery prohibited.
21	....do....	Paul Buckley	Whaling in reservation.
22	Sept. 25,1917	N. E. Bolshanin	Unalaska Island. Salting cod and salmon.
23	Nov. 1,1917	Kuskokwim Fishing & Transportation Co.	Trident Bay, Akun Island. Preserving cod and salmon; erection of cannery prohibited.
25	Jan. 5,1918	Northern Fisheries (Inc.)	Unalaska Island. Cod station.
28	Jan. 10,1918	Edwin H. Larsen	Unalaska Island. Cod and salmon operations; erection of cannery prohibited.
29	Jan. 24,1918	Northern Fisheries (Inc.)	Unalaska Island. Salmon, trout, atkafish, etc., pickling.
30	Feb. 11,1918	Buckley Livestock, Fisheries & Transportation Co.	Unalaska Island. Cod station.
31	....do....	....do....	Unalaska Island. Plant for canning and salting salmon and other fishes.
32	June 5,1918	Unalaska Atkafish Co	English Bay, Unalaska Island. Salting or mild curing atkafish, codfish, and salmon.
33	....do....	A. C. Goss	Attu Island and other points. Commercial fishery operations; erection of cannery prohibited.
34	June 29,1918	Alaska Fishing Co	Unalaska Island. Commercial fishery operations; erection of cannery prohibited.
35	Nov. 6,1918	S. Applegate	Umnak Island. Commercial fishery operations; erection of cannery prohibited.

One joint permit for operations within the Aleutian Islands Reservation was issued by the Departments of Agriculture and Commerce in 1918, and three of those previously issued continued effective, making a total of four joint permits under which operations were being carried on at the close of the calendar year.

JOINT PERMITS IN ALEUTIAN ISLANDS RESERVATION EFFECTIVE AT END OF CALENDAR YEAR 1918.

Date.	Grantee.	Location and purpose.
July 5, 1917	Andrew C. Smith	To graze cattle, sheep, goats, and other domestic animals on Umnak Island.
Oct. 29, 1917	Buckley Livestock, Fisheries & Transportation Co.	To graze cattle, sheep, and other domestic animals on the southwest end of Unalaska Island.
Dec. 8, 1917	Andrew C. Smith	To graze sheep on Dutch Harbor Island. Term of permit limited to one year.
Mar. 16, 1918	Emil Ittner	To graze hogs on Dutch Harbor(Amaknak) Island.

AFOGNAK RESERVATION.

The usual requirements in respect to commercial fishing in the Afognak Reservation were complied with by the issuance of fishing licenses to about 45 natives who desired to engage in such activities. Their work was placed under the immediate supervision of W. E. Baumann, of Afognak, who was temporarily employed as a patrolman.

The natives lost the usual May and June fishing on account of delays in securing licenses and were therefore unable to begin operations until July. Though a considerable part of the run of salmon had passed into the streams before that date, the natives made a fair catch and averaged a higher return for their season's work than ever before. This was due largely, if not wholly, to the fact that the Federal Food Administration fixed the price of salmon at a considerably higher rate than the natives had ever before received. The bulk of the catch was sold to the Kadiak Fisheries Co., at Kodiak, although Wasilie Necrassoff, a native of Afognak, pickled a few barrels of cohos, humpbacks, and reds, and the Northern Fisheries (Inc.), secured a few cohos from Litnik Bay.

No special close seasons were enforced at any of the localities fished, except that all commercial fishing was prohibited in Pauls Bay and Litnik Bay, at which places the salmon were desired for propagation. Just before the run of cohos began in Litnik Bay this prohibition was withdrawn to meet the recommendation of the superintendent of the fish-cultural station on Afognak Lake that the taking of cohos would be beneficial to the hatchery work by reducing the number of enemies of the red-salmon fry and fingerlings. Young coho salmon grow much more rapidly than red salmon, usually attaining a length of 6 to 8 inches in the two years they remain in fresh water, during which time, it is said, they feed largely upon the red-salmon fry. Considerable credence had been placed in the local report that the run of cohos in Litnik Bay attained proportions sufficient to attract and induce the natives to undertake commercial fishing for them. The results of fishing carried on during September seem to negative these reports, as the catch was less than 3,000 fish.

CATCH [a] OF SALMON BY SPECIES IN THE AFOGNAK RESERVATION IN 1918.

Locality.	Species.					Total.
	Coho.	Chum.	Humpback.	King.	Red.	
Malina		3	7,247		13,899	21,149
Paramanoff		118	40,500		22,335	62,953
Seal Bay	6		2	1	6,544	6,553
Little Afognak	1,881		23,042		7,884	32,807
Danger Bay	1,012					1,012
Litnik Bay	2,252					2,252
Total	5,151	121	70,791	1	50,662	126,726

[a] Exclusive of a small number of coho salmon purchased by the Northern Fisheries (Inc.).

A system of apportioning the district among the fishermen so as to prevent overfishing and at the same time to enable all to enjoy an equal opportunity was tried in 1918 and seemed to be very satisfactory to the natives of Afognak. Under this plan the number of natives at any one fishery was limited; the various fields were assigned to natives from certain localities, who were to enjoy the privileges thus guaranteed without interference on the part of those whose object seemed to be to take the best at each place. This moving from place to place, just as the run of fish was good, benefited comparatively few of the fishermen and always the same ones. All fields on the west side of Afognak Island were reserved for the exclusive use of the natives of Afognak, while the Spruce Island natives could operate only at the fisheries on the east side of Afognak Island, but not exclusively. Within the prescribed limits as to the number of men who might fish at any given place, all the fishing grounds on the island were open to the Afognak natives as distinguished from those from Spruce Island.

Though no seasonal closings were observed in 1918, it does not seem advisable to discontinue such regulations at the chief points of operation. While the primary purpose of the Bureau is the conservation of the fisheries, in a general way its operations affect very closely the vocations of the natives for the reason that most of them are fishermen and trappers. In the Afognak Reservation everything possible is being done in the regulation of fishery operations for the greatest benefit to the natives without injury to the fisheries.

APPARATUS AND APPROXIMATE FISHING SEASON,[a] AFOGNAK RESERVATION, 1918.

Locality.	Seined.					Gilled: Red.	Fishing season.	
	Coho.	Chum.	Humpback.	King.	Red.		Began.	Ended.
Seal Bay	6		2	1	6,160	384	June 17	Aug. 2
Little Afognak	1,881		23,042		7,834	50	June 15	Sept. 20
Danger Bay	1,012						Sept. 3	Sept. 10
Litnik Bay	*2,252						...do....	Sept. 14
Malina		3	7,247		12,674	1,225	June 18	Aug. 3
Paramanoff		118	40,500		22,335		June 13	Do.
Total	5,151	121	70,791	1	49,003	1,659		

[a] Exclusive of a small number of salmon purchased by the Northern Fisheries (Inc.).

ANNETTE ISLAND FISHERY RESERVE.

On April 28, 1916, a presidential proclamation was made creating the Annette Island Fishery Reserve in southeastern Alaska, whereby Annette Island and certain smaller islands off its coast, together with the surrounding waters, were set apart for the exclusive benefit of the Metlakatla Indians and any other Alaskan natives who might associate themselves and live with them. The Bureau of Education, Department of the Interior, has charge of the administrative affairs within the reserve. The most valuable asset thus secured to the natives is the fishery wealth of the region. To derive the greatest benefit therefrom, a plan was adopted to lease fishing privileges in the reserve to the company making the most advantageous offer. The first lease was made with P. E. Harris & Co., of Seattle, Wash., but owing to the loss by fire of its cannery on the island, nothing was done by that company. A second lease was then made, with the Annette Island Packing Co. of Seattle, under the terms of which the company was authorized to erect a cannery on Annette Island. It was required to pay a permit fee of $100 per annum for each fish trap operated in the reserve, to pay a royalty of 1 cent per fish for each salmon caught in these waters, and to give a guarantee that not less than $6,000 would be paid to the natives annually during the five years of the continuance of the lease.

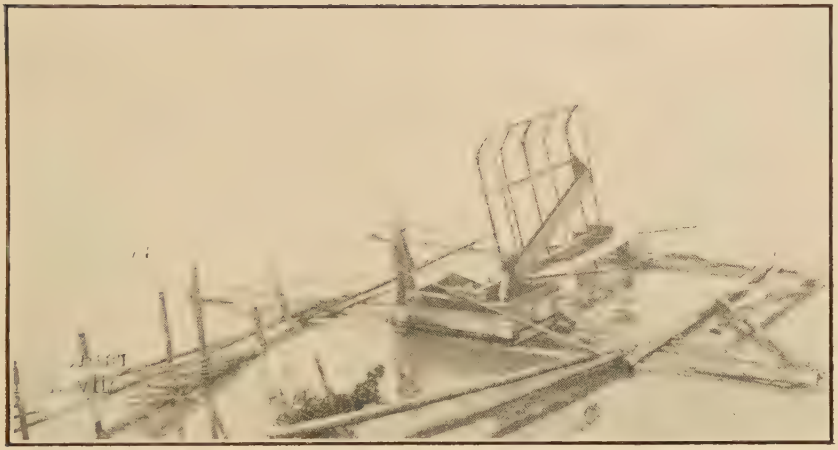
Six traps were operated in the reserve for which a permit fee of $600 was paid. A total of 1,196,669 salmon was taken by these appliances, for which the natives received a royalty of $11,966. In addition to this return, the natives were paid $12,023 for 198,012 salmon which they took with purse seines and sold to the packing company. The natives thus received as a direct return from the fisheries of the reserve a total of $24,589. Over and above this amount, further disbursements of several thousand dollars were made to them on account of labor in the cannery and during its construction.

YUKON FISHERY.

When in the spring of 1918 it became generally known by various persons residing on the Yukon River and tributary streams that, as the result of preliminary arrangements made the previous season by the Carlisle Packing Company of Seattle, a salmon cannery was to begin operations on the lower Yukon, there arose a protest against the establishment of any such enterprise having for its object the commercial utilization of salmon from Yukon waters for exportation from the Territory.

As a result of this protest an informal public hearing was held by the Bureau at Seattle on May 17, 1918, to receive the views of interested person and invite discussion by those favoring the undertaking and by those opposing it. It was thought that this conference or hearing might develop information useful in determining the best method of conducting a practical inquiry into conditions on the Yukon. The hearing was participated in by representative cannerymen and by a number of persons, including Bishop P. T. Rowe, prominently identified with the general welfare of Alaska and particularly in respect to the natives.

Those who opposed the operation of canneries on the Yukon stated that both the whites and natives are largely dependent upon salmon



A NATIVE FISH WHEEL, YUKON RIVER.

PIONEER SALMON CANNERY, YUKON RIVER, 1918.

for food for themselves and their dogs. The great need of dogs for winter transportation was mentioned. Consideration was also given to the effect of commercial fishery operations upon the general prosperity of the region drained by the Yukon and its tributaries. Those who favored the operation of canneries pointed out that a mighty stream like the Yukon ought to support a number of such establishments without detriment to the inhabitants or without injuring the future of the fishery. They spoke of the primitive methods and indifferent efforts by the natives and others to secure salmon. This, they alleged, had material bearing upon the light catch of 1917, which made it necessary to kill quite a number of dogs in the following winter because of a shortage of salmon for food. Those who opposed the cannery admitted that it was not so much a question of one cannery injuring the stream, but the fear, as expressed particularly by Bishop Rowe, that it might be the thin entering wedge for a large number of such establishments.

The preliminary hearing revealed the fact that there was a wide difference of opinion as to the necessity of limiting operations or taking any steps toward the greater protection of the Yukon fisheries. These opinions varied from the idea of absolute prohibition of all cannery operations on the Yukon and its tributaries to the view that any restrictions were both unnecessary and inexpedient, the Yukon being a river of such size and possessing such peculiarities as to render intensive and destructive fishing an impossibility.

As a result of the preliminary hearing the Bureau directed a special inquiry into conditions on the Yukon by Wardens C. F. Townsend and C. L. Larson, the former devoting attention to the lower river and the latter to the upper section. Cooperation was rendered by the Bureau of Education, United States attorneys and marshals, postmasters, commercial companies, and various persons living along the Yukon as to observations on the runs of salmon and reports regarding the number and species of fish taken, methods of capture, and disposition of catch; also expressions of opinion were given in respect to the effect of the operation of one or more canneries on the Yukon. To aid in securing uniform data, blanks prepared by the Bureau were widely distributed.

On June 12 announcement was made of a hearing to be given at Seattle on November 20, 1918, to consider the advisability of limiting or prohibiting commercial fishing for salmon in the Yukon and tributary waters.

The development of the Yukon salmon fisheries began in 1918 with the establishment of a floating cannery at Andreafski. The season's operations resulted in a pack of 13,463 cases of salmon, divided as follows: Cohos 2,661, chums 6,471, humpbacks 107, and kings 4,224 cases. In addition to this, 10,400 pounds of cohos and chums were dry-salted. The total catch of salmon for the cannery was 115,531, of which 26,144 were cohos, 73,921 chums, 3,227 humpbacks, and 12,239 kings. Fishing was carried on from the mouth of the Yukon to a point above the junction of Clear River, chiefly in that part of the Yukon delta known as Kwikluak Pass. The fishing seasons were as follows: Kings, June 26 to August 17; chums, June 28 to September 8; humpbacks, July 7 to July 29; and cohos, August 3 to September 8. Some of the cannerymen and others frequently refer to salmon of one kind by the name "Yukons" or "Yukon salmon." In so doing they mean bright or fresh-run chums.

An investment of $48,000 was made in the plant. One stern wheeler, the *Martha Clow* (65 tons net), one gas boat, the *Althea* (17 tons net), and three smaller power boats were operated in connection with the cannery. Salmon were taken with 124 gill nets aggregating 9,869 fathoms, and 6 wheels of the two-scoop pattern. Employment was given to 169 men, 55 being fishermen, 102 shoresmen, and 12 transporters. Of these 36 were natives, 13 of whom were listed as fishermen.

Stokes & Stokes operated a small saltery on the lower Yukon, packing 15 barrels of chum salmon. Their plant was valued at $1,500. Equipment consisted of one power boat and 300 fathoms of gill nets. They report having located too far up the river, but before another season will move to a point lower down.

Warden C. F. Townsend reported that one Sepella operated a saltery on the Yukon about 12 miles from salt water and that a pack of 110 barrels of chums and cohos was made. Salmon were taken with gill nets and one wheel. Mr. Townsend also advised that the Delta Fishing Co. was in the field in a small way.

Statistics compiled at the close of the season of 1918 indicate that exclusive of gear operated by the cannery and salteries near the mouth of the river, the whites and natives on the Yukon and tributary waters used 393 fish wheels, valued at $19,650, and 130 gill nets aggregating 3,250 fathoms, valued at $6,500. The estimated catch for local requirements was 1,400,000 salmon, which when dried represented approximately 700 tons of fish, valued at $140,000.

The total population of the Yukon region of Alaska, dependent in some measure on the fisheries, was estimated late in 1918 as being 10,907, of which number 6,638 were whites and 4,269 were natives. The number of dogs in the region was estimated at 6,183.

Prior to the season of 1918 the size of the run of salmon in the Yukon was an almost unknown quantity. The belief was expressed in some quarters that a comparatively small run ascended its waters, but others who were interested in the commercial exploitation of its fisheries held the opinion that a run aggregating many millions of salmon annually ascended the river. The necessity of maintaining the fisheries is paramount at all times, and if it is reasonable to suppose that a serious depletion of the supply by unrestricted fishing seems imminent, limitations must necessarily be imposed. This was done on December 14, 1918, by the promulgation of regulations affecting commercial fishing for salmon in the Yukon River. The closing order which is published in full on page 11 in this report became effective January 1, 1919.

COPPER RIVER FISHERY.

Unusual interest was centered in the Copper River fisheries in 1918. The combined catch of red, coho, and king salmon was considerably in excess of 1,000,000 as against 890,000 in 1917. The catch undoubtedly would have been heavier had it not been for certain restrictions imposed upon fishing by the regulations of December 20, 1918, although as the result of misunderstandings and for other reasons the regulations were more or less disregarded. The regulations were unsatisfactory in some respects, chiefly because of the fact that areas in the delta were included apparently not technically within

the scope of the law authorizing the Secretary of Commerce to impose limitations or prohibitions upon fishing within streams and 500 yards outside the mouths thereof. In promulgating the regulations it was thought that limitations upon fishing on the flats were essential to the protection of the salmon. The idea also was to broadly distribute any burden of necessary limitations upon fishing.

Before the fishing season of 1918 opened a number of interested cannery men requested the Secretary of Commerce to modify the order. On May 18, 1918, an informal hearing took place at Seattle, at which time discussion occurred as to the best method of handling the matter. The results did not prove helpful.

As the season advanced it became obvious that the regulations were in need of revision, hence on September 16 announcement was made by the Secretary of Commerce of a formal hearing at Seattle on November 22 to take up the matter. As a result, the new regulations which appear on page 11 in this report were promulgated on December 20, 1918.

The Bureau's activities in the Copper River region were under the immediate supervision of Assistant Agent E. M. Ball. The following extracts from Mr. Ball's reports submitted at the close of the season appear of interest:

The Copper River is the largest salmon stream in central Alaska and the one of greatest commercial importance. It is a very muddy, glacial river several hundred miles in length. It is fed by a number of fair-sized rivers, nearly all of which are of glacial origin. The river carries at all seasons a considerable amount of silt, but particularly during the summer months, when the glaciers are most active. At times it may be almost liquid mud. In the course of years a large tract of land has been built up at the mouth of the river, which is approximately 40 miles in width from east to west and 10 miles in depth from north to south. This land is known as the delta of the Copper River. Through it the river has maintained one main outlet to the sea and seven or eight lesser channels, each of which bears a distinctive name. The main channel is broken by many gravel bars, which appear as barren islands at low water. Near this channel are several sand islands which have been built up by wind and water to an elevation of several feet above the surrounding country. The greatest deposit of mud occurs to the west of the main channel and it constitutes the marshlands of the delta, being covered with vegetation to the line of mean high tide. The several outlets of the river are connected by many small sloughs, which form a veritable network of waterways throughout the delta. Seaward from this higher marshland to the sand bars which parallel the shore some 3 or 4 miles distant is a large area known as the tide or mud flats of the Copper River, where the numerous channels converge and lead to the ocean through the breaks in the sand bars beyond. When the tide ebbs from the flats, these channels appear merely as continuations of those passing through the marshlands. The greater part of the flats is bare at low water. At such times very shallow draft boats may be operated about the delta, but their movements are limited perforce to the use of the main channels. The river from the head of the delta to Miles Lake, a distance of approximately 20 miles, is swift and shallow and flows through a bed of glacial gravel. Except for a bend or two just below Childs Glacier its course is straight and through an open country.

Miles Lake is simply a widening of the river where it strikes against the face of Miles Glacier. It is nearly 4 miles wide and 6 miles long. The lake is said to be very deep, especially along the face of the glacier, which fact is indicated by the time that large pieces of ice which fall from the glacier remain submerged, often for several seconds. The northern shore is very abrupt, as is also the southern except at one place where a small stream has deposited considerable sediment. The west shore is very flat and is strewn with many bowlders. Miles Glacier forms the eastern shore.

A mile or more above the lake the river emerges from Abercrombie Canyon, which is barely 2 miles in length and about 1,000 feet in width. There are two pronounced rapids in this part of the river where the width at the head of each may be not more than 600 feet. On the west side of the canyon are precipitous mountains; on the east side is a moraine which is still underlaid with ice. On the east side of the river at the northern end of the canyon pockets known locally as "bear holes" have been cut into this buried ice. The name probably arises from the fact that bears came to this

place to feed on salmon. As the ice recedes these places will increase in size, more water will flow through them, and eventually the river may widen its channel until no canyon remains. Even during the present year there was a marked change over the conditions existing in 1917. At least one-third of the river was flowing through the bear holes.

Within the last four years the Copper River as a salmon stream has attracted unusual interest. It has emerged from a position of more or less obscurity into a place of commanding prominence. This change may be due (1) to the superior quality of the Copper River salmon, and (2) to the apparent large escapement of salmon above the then field of operations. Fishing in the delta district, as it was carried on during 1914 and several years preceding, was limited to the activities of but one cannery, that of the Northwestern Fisheries Co., whose plant was and still is located at Orca. Commercial fishery enterprises above the delta were confined to the pickling and mild curing of salmon at Abercrombie by L. L. Mikkelson, who for a few seasons had operated a saltery there, taking salmon by dip-net and gill-net fishing along the west bank of the river in Abercrombie Canyon.

In 1914 the Copper River district was visited by salmon packers who were interested elsewhere in the Alaskan fisheries or those of the Pacific coast, and special attention was given by some of them to the possibilities of operating a cannery in the vicinity of Miles Lake or Abercrombie Canyon. It was evident from the operations of Mikkelson that a considerable number of salmon were escaping the nets at the delta and that profitable fishing could be had in the lake and canyon, and with comparatively little and inexpensive gear and equipment. In the fall of 1914 the Copper River Packing Co. built a cannery at Abercrombie just north of the Mikkelson saltery, but did not operate it until the following season. In the spring of 1915 the Canoe Pass Packing Co. also entered the Copper River field and established a small cannery adjacent to the ocean dock at Cordova. The former company operated only at the up-river fields, while the operations of the latter company were limited to gill netting in the waters of the delta in competition with the Northwestern Fisheries Co. Both new companies made satisfactory packs, even surpassing their own expectations. The apparent ease with which this was done was a sufficient inducement for other interests to enter the field in 1916. Chief of these was the Carlisle Packing Co., which ventured out on a more pretentious scale than any of the older concerns had done, or even those of contemporaneous origin.

This sudden and rapid expansion of operations in the Copper River in 1916 and 1917 was regarded as unjustified and out of all proportion to the size of the run of salmon in that stream. It was further regarded that if these operations continued to expand, or even remained at the magnitude then attained, the fate of the Copper River salmon fishery would be held in the balance. In the face of such a situation failure to provide simple and reasonable protection to the salmon at this critical time would be followed by destruction of the run, if any significance is to be attached to the large and increasing amount of gear required to maintain a supply of salmon sufficient for the profitable operation of the canneries. The establishment of six canneries in the district to draw upon the run of salmon in the Copper River resulted in intensified fishing, a fact clearly indicated by a comparison of the amount of gear and the catch made by the six companies then in the field with that of the one cannery and one saltery which were in operation in 1914 and prior thereto.

As illustrative of the amazing development of activities in this field, some statistics of the amount of gear employed and the catch of salmon made in certain years may be cited. In 1914 the Northwestern Fisheries Co. operated approximately 9,500 fathoms of gill nets in the delta district, while Mikkelson used 500 fathoms of gill nets and a few dip nets at the up-river fields, thus making a total of 10,000 fathoms of nets for the entire field. The catch in that year was approximately 300,000 salmon, or an average of 30 fish per fathom of gear. In 1916 four companies fished in the waters of the delta, using approximately 35,000 fathoms of gill nets, and taking 367,000 salmon, or an average of a fraction more than 10 fish per fathom of gear. During the same season approximately 300,000 salmon were taken in Miles Lake with 5,000 fathoms of gill nets, or an average of 60 salmon per fathom of gear. A catch of approximately 150,000 salmon was made in Abercrombie Canyon by means of 50 dip nets, or an average of 3,000 fish per net. In 1917 seven companies operated in the Copper River fields. Six of these companies used approximately 52,000 fathoms of gill nets in the delta district and took 521,000 salmon, an average of about 10 salmon per fathom of gear. There were also operated in the same season 5,000 fathoms of gill nets in Miles Lake, whereby approximately 265,000 salmon were taken, an average of 53 fish per fathom of gear. A total of 70 dip nets operated in the canyon took approximately 90,000 fish, or an average of 1,285 per net.

From 1914 to 1917 there was an increase in the delta district of about 450 per cent in the amount of gear used, while the increase in the catch of salmon was only about

120 per cent. At the up-river fields the catch in 1917 was 600 per cent greater than in 1914, while there was an increase of 1,000 per cent in gear for the same season. These statistics may tell convincingly the story of the over-fishing of the Copper River, but should they not, additional evidence of that fact may be obtained from the statements of natives and whites living along the Copper River. During the seasons of 1916 and 1917 these people complained bitterly against the continuance of unrestricted commercial fishing in the Copper River, on the ground that they were being deprived of a necessary food supply, and they contended that with the extension of activities on the lower river it became more difficult from year to year for them to secure a supply of salmon from those sections of the river to which they had access. These complaints, whether just or not, must have had some basis for their origin, and they, with the rapid expansion of operations on the river, gave rise to an apprehension that the run of salmon could not survive the growing demands which were being made upon it, if unlimited fishing were allowed to continue.

To further inform itself in respect to the depletion of this fishery the Bureau directed that special investigations be made by some of its agents to determine as far as possible the probable escapement of salmon to the spawning grounds. Upon the basis of the information thus obtained, and also upon the earnest solicitation of a number of the interested salmon packers, the Department announced a hearing to be given at Seattle, Wash., on December 14, 1917, for the purpose of considering the advisability of providing further protection to the salmon of the Copper River. The hearing was held at the appointed time, and was well attended. It resulted in a discussion of various suggestions and plans to accomplish the end in view, all of which were given consideration by the Department before the promulgation of the order of December 29, 1917. The order became effective on January 1, 1918.

The run of salmon to the Copper River in 1918 began about the middle of May. During the early part of the season the run struck at Alaganik, Pete Dahl, and other sloughs in that vicinity, but as the summer advanced the main movement of the salmon into the Copper was through the channels to the eastward around Grass Island and Cottonwood Point. The run of kings and reds was exceptionally good during May and June.

In 1918 there were five companies taking salmon from the waters of the Copper River delta, operating approximately 130 fishing boats and 50,000 fathoms of gill nets, which is about 2,000 fathoms less than the quantity of gear used in the same waters in 1917. Four traps were operated near Cape Whitshed, each of which may have taken some Copper River salmon. Three were owned by the Carlisle Packing Co. and one by the Canoe Pass Packing Co.

It was fairly well understood before fishing began that the run of salmon to the Copper River in 1918 should be large, corresponding to the run in 1914. In comparison with other seasons, the appearance of salmon on the upper fishing grounds of the river in 1918 was somewhat later than usual, a fact that may be accounted for by the late breaking of winter and the consequent obstruction of many channels by ice which had a deterring effect on the movement of the salmon.

A total of 5,270 fathoms of gill-net web was used in Miles Lake, 4,150 fathoms of which belonged to the Abercrombie Packing Co., while the remaining 1,120 fathoms were owned by the Northwestern Fisheries and the Canoe Pass Packing companies. At Mile 46, R. L. Read operated 150 fathoms of gill nets. The total amount of gear in use above the delta was thus 5,420 fathoms of gill nets and 30 dip nets.

Accurate statistics of the catch of salmon in the delta region of the Copper River were not secured until after my arrival at Seattle, as the superintendents of the canneries concerned were averse to giving out such information except through their home offices. It may be that some of the companies fishing off the mouth of the Copper River did not make a complete segregation of the Copper River fish, but included therewith unavoidably some that should be credited to Eyak and Martin Rivers, but it is also likely that there was a corresponding error in the opposite direction which would offset any inaccuracy along that line. The fishermen were largely to blame in this matter because they moved from place to place over the delta, fishing where they chose without keeping a record of their catch at any point of operation. Probably all salmon taken in the offshore nets and those set from the outer sand bars are included with the Copper River catch, which vitiates to some slight extent these statistics.

In summarizing the observations of the season in regard to operations in the delta district of the Copper River in 1918, it may be said that approximately 50,000 fathoms of gill nets were used by the five companies fishing in those waters. The use of stake nets was generally followed on the tide flats; anchored nets were used chiefly in the sloughs, although some drift gill net fishing was carried on in the main channels. Near the mouth of the larger sloughs there was some congestion of nets, and also along the more important channels across the flats, such as Steamboat Slough. It was

noted that nets were not maintained in one position throughout the season; on the contrary there was a constant shifting of gear corresponding with the increase or decrease in the run of salmon at any given point. Fishermen who were fortunate in securing good locations near the outlets of the streams held those positions practically to the end of the season. Softuk Bar, which was reported as the scene of rather intensive fishing in 1917, figured but slightly in the operations of 1918.

During the first half of June ice interfered with fishing in the sloughs. Some observers thought this condition favored a larger escapement of salmon than would have been the case otherwise. Not all experienced fishermen accept this view as being correct for some maintain that a backward season invariably delays the movement of salmon into the streams. My conclusions are in accord with this view. Further proof of the correctness of this theory may be found in the fact that no appreciable number of salmon and made their appearance at Miles Lake and Abercrombie Canyon before June 10, as only a comparatively small catch was made at those localities during the first five days of the season, which was from June 5 to 10. Additional evidence that late seasons retard the movements of salmon may be gathered from the reports of conditions on Bristol Bay where the ice held later than ever before.

Red salmon were first noticed at the up-river fishing grounds early in June, but merely as stragglers. By the middle of the month the run was on in earnest, and during the remainder of the month fishing in both lake and canyon was good. There is reason to believe, however, that the number of salmon passing above the scene of commercial fishing before June 5, when the season opened, was very small. This conclusion is based primarily on the fact that very few salmon were taken in the lake or canyon before June 10.

R. L. Read operated approximately 150 fathoms of gill nets. His catch of salmon was hauled by wagon to the railroad at Mile 46 and shipped thence to the cannery of the Abercrombie Packing Co. at Abercrombie. The total number of salmon shipped from that point was in excess of 92,000.

Tom Teets had four dipping places between the canyon and the lake, two on each side of the river, and two men at each station. The catch from the stations on the east side was transferred across the river on an aerial tram to a point just south of Mile 52 on the railroad from where it was shipped to Cordova or Abercrombie by train. The other stations were on the west side of the river between Chinaman Slough and the lake. The catch at those places was hauled by a horse and cart to the lake and loaded into boats or scows and then transferred to the cars at one of the spur tracks near Mile 51 or 49. Mr. Teets began operations under a contract with the Northwestern Fisheries Co. and the Canoe Pass Packing Co. to sell his catch to them, but on June 16 he severed his contractual relations with these companies because of their failure, as he stated, to furnish him with adequate shipping facilities, and thereafter sold his fish to the Abercrombie Packing Co.

The Abercrombie Packing Co. had undisputed possession of the canyon field where dip-net fishing exclusively was carried on. Seven men operated on the east side of the river opposite snowsheds No. 1 and No. 2, where steel cables span the canyon. Fifteen men were employed in like manner on the west side of the river in the canyon. This company also operated four-fifths of the gear set in Miles Lake, or 4,150 fathoms of gill nets, in the handling of which 38 men were employed.

The Northwestern Fisheries Co. and the Canoe Pass Packing Co., working under an arrangement to divide the catch, stationed 15 men at Miles Lake who engaged in gill-net fishing, operating a total of 1,120 fathoms of nets.

The total amount of gear in use above the delta was 5,420 fathoms of gill nets and 30 dip nets.

Toward the end of the season, after the Northwestern Fisheries Co. and the Canoe Pass Packing Co. had discontinued fishing in the lake, L. T. Robbins, formerly employed by these companies, pickled 100 barrels of red salmon at the lake, using in this work part of the company gear.

TOTAL CATCH OF SALMON BY SPECIES IN THE COPPER RIVER IN 1918.

Locality.	Species.			Total.
	Coho.	King.	Red.	
Delta	43,419	5,646	1,098,057	1,147,122
Above delta	6,770	15,203	490,781	512,754
Total	50,189	20,849	1,588,838	1,659,876

The number of red salmon taken from the Copper River in 1918 equaled 95.72 per cent of the total catch; kings equaled 1.26 per cent; and cohos 3.02 per cent. Out of the total catch of red salmon, 69.11 per cent was taken in the waters of the delta, while 30.89 per cent came from the up-river fishing grounds. Twenty-five per cent of the total catch of kings was taken from delta waters, as against 75 per cent from the river above the delta.

At the close of the fishing season on the Copper River in 1917 it was conceded by those interested in the salmon fisheries of that region, and others who had intimate knowledge of conditions there, that alarming drains had been made on the supply of salmon and that unless greater protective measures were adopted than those afforded by the general fishery law a serious and permanent depletion was inevitable. This condition was the more acute for the reason that the season of 1916 also showed in proportion to the gear in use a falling off in catch from that of the two years immediately preceding. The fact that 10,000 fathoms of gill nets was sufficient to catch 400,000 salmon in the Copper River in 1914 and that in 1916 the use of 40,000 fathoms was required to take double that number, or 800,000, would seem to foreshadow depletion in direct ratio to the increase in gear. The simple logic of it all is that as the scale of one ascends the other naturally descends. Equilibrium could be restored only by a reduction in the amount of gear which automatically would make possible a greater escapement of salmon. This fact was brought out prominently at the hearing given in Seattle, Wash., December 14, 1917, when, as the record of that meeting seems to show, not a dissenting voice was heard in opposition to the well-founded opinion that the valuable salmon fisheries of the Copper River had suffered considerable depletion already and were then in danger of complete destruction by unrestrained commercialism. The time to act was therefore apparent to all.

While there may have been some disagreement with regard to details, there was a unanimity of opinion in respect to essentials—the run of salmon was being depleted and something should be done to stop it. Fishing activities were rapidly approaching the danger point and serious consequences were in sight if they continued unchecked much longer.

To understand thoroughly the peculiar conditions existing at the mouth of the river, and to know the extent of the delta, the entire region should be seen at low water. No published map or chart adequately portrays them. If observations are made at low water, it will be found that these several streams which are the outlets of the Copper River traverse the mud flats to the outer sand bars through channels having well-defined banks. Naturally, at high water, these streams are dispersed in all directions after they emerge from the grass banks, but even so, that is no reason for saying that the mud flats and sand bars are not as much a part of the delta as the grass-covered marshlands which are overflowed only at extreme high tide. The delta of the Copper River is a physical fact, and it must necessarily lie within the mouth of the river. That being so, it would seem that under the law the Secretary of Commerce had ample authority to limit or prohibit fishing in at least all of the waters inside of and within 500 yards outside of the several outlets through the sand bars.

SALMON HATCHERIES.

EXTENT OF OPERATIONS.

In 1918 the propagation of salmon in Alaska was carried on at four fish-cultural stations, two of which were operated by the Government and two by private interests. The capacity of these hatcheries is approximately 280,000,000 red-salmon eggs, the two Government stations being able to take care of 150,000,000.

In 1917 the total collection of red-salmon eggs in Alaska was 115,964,000. The number of salmon liberated in Alaskan waters in the season of 1917–18 was 90,390,200, which was 65,250,800 less than in 1916–17. The take of red-salmon eggs in 1918 was 142,001,000, or 26,037,000 more than in 1917. This increase was due to the fact that considerably larger takes were made at the McDonald Lake (formerly Yes Bay), Fortmann, and Quadra hatcheries. The collection of eggs at the Afognak station was also approximately 1,500,000 greater than in the previous year. Operations at the Uganik and Seal Bay substations of Afognak were not carried on in 1918.

OPERATIONS OF ALASKA HATCHERIES IN 1918.

Stations.	Red or sock-eye salmon eggs taken 1917.	Red or sock-eye salmon liberated in 1917–18.	Red or sock-eye salmon eggs taken 1918.
McDonald Lake (Yes Bay)	34,950,000	32,539,200	[a] 47,300,000
Afognak	[b] 53,036,000	31,427,000	[c] 54,681,000
Seal Bay	2,712,000	[d] 2,712,000	
Fortmann	6,840,000	6,135,000	[e] 19,620,000
Quadra	13,600,000	12,990,000	20,400,000
Hetta	4,826,000	4,587,000	
Total	115,964,000	90,390,200	142,001,000

[a] 1,365,000 humpback-salmon eggs were also taken.
[b] 18,000,000 eyed eggs transferred to Oregon, Washington, and British Columbia.
[c] 8,697,000 humpback-salmon eggs were also taken.
[d] Eyed eggs.
[e] 3,660,000 humpback-salmon eggs were also taken.

HATCHERY REBATES.

The Federal fishery law of Alaska provides that the catch and pack of salmon by the operators of private hatcheries shall be exempt from all license fees and taxation of every nature at the rate of 10 cases of canned salmon to every 1,000 red or king salmon fry liberated upon compliance with certain conditions, among which may be mentioned the filing of affidavits with the clerk of the district court of the division of Alaska wherein the hatchery is located and with the Secretary of Commerce, showing the number of red-salmon fry released during the fiscal year for which report is made. The following table gives the rebates due to private operators for the fiscal year ending June 30, 1918:

REBATES CREDITED TO PRIVATE SALMON HATCHERIES DURING THE FISCAL YEAR ENDED JUNE 30, 1918.

Owners.	Location.	Red-salmon fry liberated.	Rebate due.
Alaska Packers Association	Naha Stream	6,135,000	$2,454.00
Northwestern Fisheries Co.	Quadra Lake	12,990,000	5,196.00
Do	Hetta Lake	4,587,000	1,834.80
Total		23,712,000	9,484.80

HATCHERY INSPECTION.

The law provides that all private hatcheries shall be inspected by order of the Secretary of Commerce and that no rebate certificates shall be issued to the owners of such establishments until the efficiency of the hatcheries has first been approved by the Secretary of Commerce in the manner provided by law. The necessary inspections were made and the character of operations approved.

HATCHERY OPERATIONS.

MCDONALD LAKE.

The name Yes Bay, as applied to the hatchery on McDonald Lake, was obviously inappropriate, as the hatchery is not located on the bay. It has been decided, therefore, that henceforth this station

will be known as the McDonald Lake hatchery. In 1917 the egg-collecting season began on September 11 and ended September 26. In that time 34,950,000 red-salmon eggs were collected, out of which number 32,539,200 fry were liberated in McDonald Lake and tributaries. Losses aggregated 2,410,800 eggs and fry, or approximately 6⅞ per cent.

In 1918 spawning operations began August 29 and ended October 2 and resulted in a collection of 47,300,000 red-salmon eggs. A collection of 1,365,000 humpback-salmon eggs was also made.

AFOGNAK.

During the spawning season of 1917 the Afognak station made a collection of 53,036,000 red-salmon eggs, operations beginning July 30 and ending September 11. Of that number, 18,000,000 eyed eggs were distributed among hatcheries in Oregon, Washington, and British Columbia. The remaining 35,036,000 were incubated at the Afognak hatchery. The loss of eggs was 2,221,000 and fry 1,388,000, a total of 3,609,000, or 6¼ per cent of the total take. The number of red-salmon fry planted in Litnik Lake and its tributaries was 31,427,000.

The spawning season of 1918 began July 30 and ended October 2, during which period 54,681,000 red-salmon eggs were taken. A collection of 8,697,000 humpback-salmon eggs was also made.

The substations at Seal Bay and Uganik were not operated in 1918.

FORTMANN.

The Alaska Packers Association owns and operates the Fortmann hatchery on Heckman Lake, Revillagigedo Island, southeastern Alaska. This hatchery was built in 1901 and is now the largest plant of its kind in Alaska, having a capacity of 110,000,000 salmon eggs. It has been in continuous operation since the date of its construction, a period of more than 18 years. In that time 643,617,000 red salmon have been liberated therefrom.

Out of the 6,840,000 red-salmon eggs taken in 1917 between September 3 and October 20, there were hatched and planted 6,135,000 fry. The loss was 705,000, or approximately 10⅓ per cent. A collection of 2,400,000 humpback-salmon eggs was also made in 1917, from which 1,845,000 fry were produced and planted. Between August 28 and November 15, 1918, a total take of 19,620,000 red-salmon eggs was made. Humpback-salmon eggs to the number of 3,660,000 were taken between September 13 and November 15.

QUADRA.

The Northwestern Fisheries Co. owns and operates the hatchery located near Quadra, in southeastern Alaska. This plant has a capacity of approximately 21,000,000 red-salmon eggs. The taking of eggs in 1917 began August 13 and ended November 3, during which period 13,600,000 were collected. Out of this number there were hatched and planted 12,990,000 red-salmon fry, the total loss being 610,000, or approximately 4½ per cent.

Spawn-taking at this hatchery in 1918 began August 14 and ended September 28. In that time a collection of 20,400,000 red-salmon eggs was made.

HETTA.

The Hetta hatchery is also owned and operated by the Northwestern Fisheries Co. and is located on Hetta Lake, in southeastern Alaska. It has a capacity of approximately 12,000,000 red-salmon eggs. In 1917 egg collecting began August 15 and ended December 14, resulting in a take of 4,826,000 eggs, from which 4,587,000 red-salmon fry were hatched and liberated. The loss was 239,000, or approximately 4.9 per cent.

This hatchery was closed on June 30, 1918. No eggs were taken during the spawning season of 1918.

GENERAL STATISTICS OF THE FISHERIES IN 1918.

The total investment in the Alaska fisheries in 1918 was $73,750,789, an increase of $18,813,240 over 1917. Approximately 90 per cent of this investment was in the salmon industry. The number of persons engaged in 1918 was 31,213, an increase of 1,722 over 1917. The total value of the products in 1918 was $59,154,859, an increase of $7,677,879 over 1917. This is an increase of about 15 per cent over the value of the products in 1917.

SUMMARY OF INVESTMENTS IN THE FISHERIES OF ALASKA IN 1918.

Industries.	Southeast Alaska.	Central Alaska.	Western Alaska.	Total.
Salmon canning	$28,971,126	$11,960,681	$22,969,590	$63,901,397
Salmon mild-curing	786,342			786,342
Salmon pickling	278,306	492,160	592,491	1,362,957
Salmon freezing	124,172			124,172
Salmon, fresh	114,689			114,689
Salmon dry-salting			58,345	58,345
Salmon drying and smoking			26,150	26,150
Salmon by-products	109,782			109,782
Herring fishery	1,018,394	722,135	62,288	1,802,817
Halibut fishery	2,607,792			2,594,292
Cod fishery		805,484	465,634	1,271,118
Whale fishery	393,037	22,914	935,020	1,350,971
Clam fishery	1,200	246,557		247,757
Crab fishery	739			
Total	34,405,579	14,249,931	25,109,518	73,750,789

SUMMARY OF PERSONS ENGAGED IN THE FISHERIES OF ALASKA IN 1918.

Races.	Southeast Alaska.	Central Alaska.	Western Alaska.	Total.
Whites	7,862	3,717	6,114	17,693
Natives	3,157	1,030	1,064	5,251
Japanese	857	306	346	1,509
Chinese	1,374	562	798	2,734
Filipinos	731	279	328	1,338
Mexicans	276	229	1,204	1,709
Miscellaneous	400	96	483	979
Total	14,657	6,219	10,337	31,213

SUMMARY OF PRODUCTS OF THE ALASKAN FISHERIES IN 1918.

Products.		Quantity.	Value.
Salmon:			
Canned	cases	6,605,835	$51,041,949
Mild-cured	pounds	3,158,400	607,951
Pickled	do	11,378,000	1,079,881
Frozen	do	1,877,922	170,864
Fresh (including local)	do	4,760,915	386,576
Dry-salted	do	516,975	47,544
Dried and smoked	do	1,400,000	140,000
By-products, oil	gallons	4,624	4,624
By-products, fertilizer	pounds	1,368,000	35,423
Herring:			
Canned	cases	31,719	231,735
Dry-salted	pounds	100,000	1,500
Fresh for food	do	606,326	6,564
Fresh for bait	do	1,407,200	17,827
Frozen for bait	do	4,152,835	36,654
Pickled, Scotch cure	do	9,744,175	748,606
Pickled, Norwegian cure	do	8,958,515	632,402
Oil	gallons	138,012	97,000
Fertilizer	pounds	1,290,000	47,250
Halibut:			
Fresh (including local consumption)	do	10,491,777	1,315,985
Frozen	do	3,337,529	348,866
Dry-salted	do	40,400	2,835
Cod:			
Canned	cases	2,336	14,175
Dry-salted	pounds	10,902,507	778,737
Pickled	do	2,650,073	142,200
Stockfish	do	38,268	7,128
Tongues	do	18,800	1,840
Frozen	do	273,326	10,312
Fresh	do	67,458	2,742
Oil	gallons	50	50
Whales:			
Oil	do	672,989	421,942
Sperm oil	do	338,931	327,420
Fertilizer	pounds	2,059,600	74,255
Bone	do	8,223	1,644
Ivory	do	866	216
Meat, frozen	do	148,000	7,400
Beluga hides	do	2,500	1,250
Clams	cases	43,575	214,504
Trout:			
Canned	do	2,641	24,568
Fresh	pounds	60,218	6,575
Frozen	do	9,500	768
Pickled	do	21,000	1,773
Sablefish, fresh, frozen, and pickled	do	1,336,039	67,351
Red rockfish	do	338,669	12,186
Crabs	dozens	720	1,440
Shrimps:			
Canned	cases	524	3,200
Fresh	pounds	48,204	10,806
Atkafish, pickled	do	7,850	645
Miscellaneous fresh fish	do	246,968	7,696
Total			59,154,859

SALMON INDUSTRY.

A very material increase occurred both in quantity and value of products in the salmon industry of Alaska in 1918. In view of the unprecedented returns for 1917, the results of operations during 1918 were very satisfactory. As will usually be the case, some sections produced smaller numbers of salmon than in the preceding season, while notable gains occurred in other places. This oscillating movement of the salmon runs does not affect all districts alike at the same time, for where one region produces only a light run another yielding in superabundance makes good the shortage. Such conditions are not the best for the packers, as they are unable to determine accurately the extent of preparations for operations each season, though some

conclusions of value may be reached by study and analysis of the records of past seasons, applying the four or five year cycle theory for red and king salmon and the shorter cycles for the other species.

The increased production may be due in part to the greater number of canneries in Alaska, but this is not necessarily true, as the productivity of any field has a limit which when once reached inevitably restricts the yield. This conclusion is borne out by results in southeastern Alaska in 1918 where 14 more canneries were operated than in 1917, but which yielded an increase of but 80,601 cases of salmon, an average of less than 6,000 cases. Double the number of canneries will not change the situation once the maximum productivity of the field has been reached. This condition is further controlled by two factors which in a way predetermine the correctness of the foregoing statement, i. e., (*a*) the escapement of salmon for reproductive purposes, and (*b*) the area of the spawning grounds.

There was no great change in the value of products, possibly for the reason that the Government, through the Food Administration, regulated prices upon all grades of salmon, thus preventing any notable rise in prices for canned salmon. A large part of the pack of canned salmon was commandeered for military uses by the United States and allied nations.

The production of canned salmon in southeastern Alaska exceeded that of 1917 by less than 81,000 cases, the only increase being that of chum salmon, which hardly more than equaled the falling off in the other species. The run of salmon seemed to be rather general and uniform throughout the district, in striking contrast to that of 1917, when the bulk of the catch was made in the Icy Strait district. Sixteen new canneries were operated in southeastern Alaska in 1918, while 2 of those operating in 1917 were dropped from the list, thus making a net gain of 14.

In central Alaska 3 new canneries were put into operation, while 1 was discontinued, the net gain being 2. Of the new plants, 2 are credited to the Prince William Sound district and 1 to the Kodiak section. Central Alaska shows a greater gain in the number of cases of canned salmon produced than either the southeastern or western districts, there being an increase of approximately 380,000 cases, or more than 35 per cent. This is due to a considerably better catch of cohos, chums, and humpbacks. There was a moderate decline in the number of cases of kings and reds packed, which as regards the latter was due to a falling off of nearly 50 per cent in the run of red salmon at Karluk and the south end of Kodiak Island.

The industry in western Alaska shows a gain of 1 cannery, 2 plants having been put in operation in 1918, while 1 was permanently dismantled and closed. There was a tremendous run of red salmon to Bristol Bay which struck with full force immediately after the rivers were free from ice. The canneries were almost swamped with fish at the beginning of the season. This condition prevented the largest use of the available supply of salmon and curtailed the pack somewhat. This, however, was not without some benefit to the run, as a much larger escapement of fish to the spawning grounds undoubtedly resulted.

For the first time in the history of the industry a salmon cannery was operated on the Yukon River and made a small pack of coho, chum, humpback, and king salmon. Expectations in respect to the probable pack were not realized, as fishing could not begin until the river was free from ice, which did not occur until late in June. It was reported by those interested in the commercial exploitation of the salmon fisheries of the Yukon that a very large run of coho, chum, and king salmon, especially the latter, ascended the river, there being countless millions of these fish; they further stated that no appreciable impression on the supply of salmon in that region could be made if a number of canneries were in operation.

This view seems to have been shared by a number of persons who have lived on the Yukon for years, as several of them have reported an almost inexhaustible supply of salmon annually ascending the Yukon. Contrary opinions, equally well supported, hold that the run of salmon was not large and that it would not be able to stand the drain of commercial fishing without seriously jeopardizing the continuing supply and depriving local inhabitants of an important and indispensable food article. Exact knowledge of the salmon runs in the Yukon River is limited, and until further investigations can be made the correctness of either contention is problematical. Realizing the great importance of the situation, the Bureau plans to have a thorough and comprehensive study made as soon as practicable by several of the best authorities on the habits and runs of salmon.

In western Alaska the increase in pack over that of 1917 was approximately 200,000 cases, more than half of which was red salmon. The next greatest increase was in the pack of chums, which was more than double that of 1917, when 51,000 cases were produced.

Approximately 24,500,000 red salmon were taken in western Alaska in 1918, of which number about 23,000,000 were utilized in the canning industry, while the remaining 1,500,000 were pickled.

SALMON CATCH AND FORMS OF GEAR.

As heretofore, the apparatus employed in the salmon fisheries of Alaska consisted chiefly of gill nets, seines, and pound nets or traps. There were 838 seines in operation, the aggregate length of which was 131,127 fathoms. This is an increase of 239 over the number of seines used in 1917, southeast Alaska showing an increase of 175, central Alaska an increase of 59, and western Alaska a gain of 5.

In the salmon industry 4,367 gill nets, measuring 479,112 fathoms were used. They were divided among the three districts as follows: Southeast Alaska, 435 gill nets, a gain of 7 over the number reported in 1917; central Alaska, 1,158, an increase of 9; and western Alaska, 2,774, a decrease of 762. This is a net decrease of 746 gill nets from 1917.

There were in use in the salmon industry 79 floating and 473 driven pound nets, a total of 552. This is an increase of 82 over 1917. Of the number operated in 1918, southeast Alaska had 79 floating and 290 driven, gains of 7 and 47, respectively; central Alaska had 166 driven pound nets, a gain of 30 over 1917, the increase being largely due to the operations of two new canneries in the western part of the district and the introduction of this apparatus in Prince William Sound, where it had not formerly been used; and western Alaska had 17 driven pound nets, as against 19 in 1917, a decrease of 2.

Considering Alaska in its entirety, there was an increase over 1917 of 33 per cent in the number of fathoms of seines operated in the salmon industry; the number of fathoms of gill nets decreased 2.9 per cent; and pound nets increased 17 per cent in number.

Of the total catch of salmon in Alaska in 1918, 41 per cent were taken by pound nets, 30 per cent by seines, 28 per cent by gill nets, and 1 per cent by lines, dip nets, and wheels. In 1917 seines caught 32 per cent of the salmon taken in Alaska, pound nets 39 per cent, gill nets 28 per cent, while the other appliances caught the remaining 1 per cent. The catch by pound nets in 1918 increased 2 per cent, but the catch by gill nets remained the same as in 1917. The catch by seines decreased 2 per cent from that of 1917. The following table shows the proportionate catch by districts according to the principal kinds of apparatus used:

PERCENTAGE OF SALMON CAUGHT IN EACH DISTRICT BY PRINCIPAL FORMS OF GEAR.

Apparatus.	Southeast Alaska.		Central Alaska.		Western Alaska.	
	1917	1918	1917	1918	1917	1918
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Seines	41	38	48	39	2	4
Pound nets	55	58	38	48	4	4
Gill nets	2	2	12	11	94	90

The total take of salmon in Alaska in 1918 was 101,454,688, as against 92,600,495 in 1917, an increase of 8,854,193. There was a decrease of 2,109,110 salmon in southeast Alaska, and an increase of 8,534,072 in central Alaska, and 2,429,231 in western Alaska. Further comparison of the catch of Alaska as a whole with that of 1917 shows that chums increased 5,633,240, humpbacks 3,441,091, cohos 807,428, and kings 131,416. Reds declined 1,158,982.

In this connection it appears of interest to record that a total of 838 seines used in the salmon fisheries of Alaska took 29,986,747 salmon, an average of 35,783 per seine; a total of 552 pound nets used in the same fisheries caught 41,725,505 salmon, an average of 75,589 per pound net. The relative efficiency of the two forms of gear was at the ratio of 7 to 15 in favor of pound nets.

SALMON TAKEN IN 1918, BY SPECIES AND APPARATUS, FOR EACH GEOGRAPHIC SECTION OF ALASKA.

Apparatus and species.	Southeast Alaska.	Central Alaska.	Western Alaska.	Total.
Seines:	*Number.*	*Number.*	*Number.*	*Number.*
Coho, or silver	373,266	91,161	3,909	468,336
Chum, or keta	5,313,484	1,904,905	218,056	7,436,445
Humpback, or pink	13,443,548	4,903,845	110,876	18,458,269
King, or spring	16,765	1,468	5,439	23,672
Red, or sockeye	795,843	1,905,680	898,502	3,600,025
Total	19,942,906	8,807,059	1,236,782	29,986,747
Gill nets:				
Coho, or silver	249,249	459,584	127,194	836,027
Chum, or keta	198,720	274,962	682,493	1,156,175
Humpback, or pink	91,385	29,597	221,498	342,480
King, or spring	20,935	90,145	92,764	203,844
Red, or sockeye	516,721	1,737,758	23,420,020	25,674,499
Total	1,077,010	2,592,046	24,543,969	28,213,025

SALMON TAKEN IN 1918, BY SPECIES AND APPARATUS, FOR EACH GEOGRAPHIC SECTION OF ALASKA—Continued.

Apparatus and species.	Southeast Alaska.	Central Alaska.	Western Alaska.	Total.
Pound nets:	*Number.*	*Number.*	*Number.*	*Number.*
Coho, or silver	699,726	338,432	10,000	1,048,158
Chum, or keta	3,645,567	1,409,411	210,195	5,265,173
Humpback, or pink	24,087,172	4,985,417	430,617	29,503,206
King, or spring	31,667	27,951	9,902	69,520
Red, or sockeye	1,422,786	4,038,379	378,583	5,839,748
Total	29,886,918	10,799,590	1,039,297	41,725,805
Lines:				
Coho, or silver	300,395			300,395
Chum, or keta	29,500			29,500
Humpback, or pink	9,269			9,269
King, or spring	371,719			371,719
Red, or sockeye	21,108			21,108
Total	731,991			731,991
Dip nets:				
Coho, or silver		8,503		8,503
King, or spring		8,890		8,890
Red, or sockeye		202,685		202,685
Total		220,078		220,078
Wheels:				
Coho, or silver			250,262	250,262
Chum, or keta			273,525	273,525
Humpback, or pink			3,138	3,138
King, or spring			50,117	50,117
Total			577,042	577,042
Total:				
Coho, or silver	1,622,636	897,680	391,365	2,911,681
Chum, or keta	9,187,271	3,589,278	1,384,269	14,160,818
Humpback, or pink	37,631,374	9,918,859	766,129	48,316,362
King, or spring	441,086	128,454	158,222	727,762
Red, or sockeye	2,756,458	7,884,502	24,697,105	35,338,065
Grand total	51,638,825	22,418,773	27,397,090	101,454,688

SALMON CANNING.

NEW CANNERIES.

The number of salmon canneries in Alaska was increased during 1918 by the addition of 17 over the number reported for 1917, making a total of 135 for the Territory.

In southeastern Alaska 16 new canneries were put in operation, but there was a net gain of only 14, one plant, that of Robert Scott, at Craig, having failed to resume operations in 1918, while the plant of the Sunny Point Packing Co. was destroyed by fire in 1917 and was not rebuilt. The new plants are as follows:

Alaska Clam Canning Co.....Petersburg.
Alaska Fisheries Co.....Washington Bay.
Alaska Packing & Navigation Co.....Pavlof Harbor.
American Packing Co.....Juneau.
Annette Island Packing Co.....Metlakatla.
Columbia Salmon Co.....Tenakee.
Deep Sea Salmon Co.....Port Althorp.
Hidden Inlet Canning Co.....Hood Bay.
T. E. P. Keegan.....Douglas.
Northern Packing Co. (Inc.).....Juneau.
Noyes Island Packing Co.....Steamboat Bay.
Pybus Bay Fish & Packing Co.....Pybus Bay.
Pyramid Packing Co.....Sitka.
Southern Alaska Canning Co.....Quadra Bay.
Todd Packing Co.....Peril Strait.
H. Van Vlack & Co.....Thomas Bay.

In central Alaska 3 new canneries were operated, making a net gain of 2 for the district, as the plant of the Deep Sea Salmon Co., at Knik Arm, was discontinued. The new canneries are as follows:

Alaska Sea Food Co.	Cordova.
Alitak Packing Co.	Lazy Bay.
Kenai Packing Co.	Drier Bay.

In western Alaska 2 new canneries were opened, but there was a net gain of only one as the canning of salmon at the plant of the Pacific American Fisheries, at Makushin Bay, was discontinued. The new canneries are as follows:

Carlisle Packing Co.	Andreafski (floating).
Northwestern Fisheries Co.	Naknek River.

CHANGES IN CANNERIES.

Important changes in the ownership of several canneries in Alaska were noted in 1918. It appears that there is a tendency toward consolidation of interests in the salmon-canning business of Alaska, due apparently in some measure to a movement toward more economical management and operation. A number of concerns which have been listed among Alaskan packers for several seasons do not appear in the list of operators in 1918. Among these may be mentioned the Taku Canning & Cold Storage Co., at Taku Harbor, which sold its cannery to Libby, McNeill & Libby; the Wiese Packing Co., which disposed of its cannery at Rose Inlet to the Southern Alaska Canning Co.; the Pillar Bay Packing Co., which sold its cannery at Point Ellis to the Fidalgo Island Packing Co. and ceased to be an operator in Alaska; the Sanborn-Cram Co. became the Burnett Inlet Packing Co.; the Sitka Packing Co. acquired the cannery partly constructed in 1917 by J. H. Long, at Sitka, and operated it during the season of 1918; the J. H. Long Packing Co., at Juneau, was succeeded by the American Packing Co., which acquired possession of the cannery of the former concern.

There were also a number of changes in the ownership or control of salmon canneries in Alaska, which, however, did not affect the name of the companies concerned. Mention may be made of the following acquisitions: The Wilson Fisheries Co. now controls the Alaska Herring & Sardine Co., at Port Walter, and the J. L. Smiley Co., at Ketchikan. Both of these plants were improved, the former by the installation of three lines of canning machines, and the latter by the addition of one line. The Northern Fisheries (Inc.), purchased the Alaska Salmon Co., but continued the operation of the cannery on Wood River in the name of the latter company.

The cannery at Abercrombie, Alaska, on the Copper River, formerly operated by the Copper River Packing Co., is now operated in the name of the Abercrombie Packing Co. The Bering Sea Packing Co., at Herendeen Bay, became the Everett Packing Co. The cannery of the Astoria & Puget Sound Canning Co., at Excursion Inlet, destroyed by fire in 1917, was rebuilt in time for operations in 1918.

Of the number of canneries in operation in 1917, each of the three districts of Alaska as subdivided by this report lost one, as follows: In southeastern Alaska the cannery of Robert Scott, at Craig, ceased to operate; in central Alaska, the Deep Sea Salmon Co. dismantled its cannery on Knik Arm, Cook Inlet; in western Alaska, the Pacific American Fisheries permanently closed its cannery at Makushin Bay, but stated its intention to continue cod-fishery operations in that region.

CANNERIES OPERATED IN 1918.

There were 135 salmon canneries in operation in Alaska in 1918, divided among the three districts as follows: Southeast Alaska, 76; central Alaska, 29; western Alaska, 30.

COMPANIES CANNING SALMON IN ALASKA, NUMBER AND LOCATION OF CANNERIES OPERATED, AND NUMBER OF POUND NETS OWNED BY EACH.

Name.	Canneries.	Location.	Pound nets.
Southeast Alaska:			
Alaska Clam Canning Co	1	Petersburg	
Alaska Fish Co	1	Waterfall	2
Alaska Fisheries Co	1	Washington Bay	
Alaska Herring & Sardine Co	1	Port Walter	
Alaska Pacific Fisheries	3	Chilkoot	11
		Chomly	[a] 8
		Yes Bay	[b] 13
Alaska Pacific Herring Co	1	Big Port Walter	
Alaska Packers Association	2	Loring	[c] 10
		Wrangell	[c] 6
Alaska Packing & Navigation Co	1	Pavlof Harbor	
Alaska Sanitary Packing Co	1	Wrangell	3
American Packing Co	1	Juneau	
Anacortes Fisheries Co	2	Kasaan	7
		Shakan	3
Annette Island Packing Co	1	Metlakatla	5
Astoria & Puget Sound Canning Co	1	Excursion Inlet	10
Auk Bay Salmon Canning Co	1	Auk Bay	7
Baranof Packing Co	1	Red Bluff Bay	[d] 1
Barnes, F. C., Co	1	Lake Bay	3
Beegle Packing Co	1	Ketchikan	[e] 4
Burnett Inlet Packing Co	1	Burnett Inlet	[d] 4
Cole, R. L	1	Deweyville	1
Columbia Salmon Co	2	Craig	1
		Tenakee	4
Deep Sea Salmon Co	2	Ford Arm	[d] 4
		Port Althorp	[d] 13
Doyhof Fish Products Co	1	Scow Bay	[d] 1
Fidalgo Island Packing Co	2	Ketchikan	8
		Pillar Bay	6
George Inlet Packing Co	1	George Inlet	1
Haines Packing Co	1	Letinkof Cove	
Harris, P. E., & Co	1	Hawk Inlet	
Hidden Inlet Canning Co	2	Hidden Inlet	[f] 5
		Hood Bay	4
Hoonah Packing Co	2	Gambier Bay	9
		Hoonah	[g] 16
Hume Co., G. W	1	Nakat Harbor	[g] 8
Karheen Packing Co	1	Karheen	5
Keegan, T. E. P	1	Douglas	
Ketchikan Packing Co	1	Ketchikan	
Lane & Williams	1	Moira Sound	
Libby, McNeill & Libby	2	Taku Harbor	15
		Yakutat	
Marathon Fishing & Packing Co	1	Petersburg	
Myers & Co., Geo. T	1	Chatham	9
North Pacific Trading & Packing Co	1	Klawak	
Northern Packing Co. (Inc.)	1	Juneau	
Northwestern Fisheries Co	5	Dundas Bay	[f] 13
		Hunter Bay	[e] 1
		Quadra	5
		Roe Point	[f] 7
		Santa Ana	
Noyes Island Packing Co	1	Steamboat Bay	
Pacific American Fisheries	1	Excursion Inlet	16
Petersburg Packing Co	1	Petersburg	4
Point Warde Packing Co	1	Point Warde	
Pure Food Fish Co	1	Ketchikan	[e] 4
Pybus Bay Fish & Packing Co	1	Pybus Bay	
Pyramid Packing Co	1	Sitka	
Sanborn-Cutting Co	1	Kake	[d] 8
Sitka Packing Co	1	Sitka	
Smiley, J. L., & Co	1	Ketchikan	4
Southern Alaska Canning Co	2	Quadra Bay	[e] 2
		Rose Inlet	5
Starr-Collinson Packing Co	1	Moira Sound	[d] 5
Straits Packing Co	1	Skowl Arm	
Sunny Point Packing Co	1	Ketchikan	[e] 5

[a] 4 floating. [c] 5 floating. [e] 1 floating. [g] 2 floating.
[b] 9 floating. [d] All floating. [f] 3 floating.

COMPANIES CANNING SALMON IN ALASKA, NUMBER AND LOCATION OF CANNERIES OPERATED, AND NUMBER OF POUND NETS OWNED BY EACH—Continued.

Name.	Canneries.	Location.	Pound nets.
Southeast Alaska—Continued.			
Swift-Arthur-Crosby Co.	1	Heceta Island	4
Tee Harbor Packing Co.	1	Tee Harbor	
Tenakee Fisheries Co.	1	Tenakee Inlet	6
Thlinket Packing Co.	1	Funter	23
Todd Packing Co.	1	Peril Strait	3
Union Bay Fisheries Co.	1	Union Bay	4
Van Vlack, H., & Co.	1	Thomas Bay	
Ward's Cove Packing Co.	1	Ward Cove	2
Central Alaska:			
Abercrombie Packing Co.	1	Abercrombie	
Alaska Packers Association.	4	Alitak	4
		Chignik	3
		Kasilof	13
		Larsen Bay	
Alaska Sea Food Co.	1	Cordova	
Alitak Packing Co.	1	Lazy Bay	2
Canoe Pass Packing Co.	1	Shepard Point	4
Carlisle Packing Co.	1	Cordova	9
Clark-Graham Co.	1	Eyak River	
Columbia River Packers' Association.	1	Chignik	6
Copper River Packing Co.	1	Port Nellie Juan	4
Fidalgo Island Packing Co.	1	Port Graham	5
Hoonah Packing Co.	1	Katalla	
Kadiak Fisheries Co.	1	Kodiak	1
Kenai Packing Co.	1	Drier Bay	
Libby, McNeill & Libby	1	Kenai	16
Lighthouse Canning Co.	1	Cordova	
Moore Packing Co.	1	Orca Inlet	1
Northwestern Fisheries Co.	5	Chignik	3
		Kenai	16
		Orca	
		Seldovia	7
		Uyak	
Pacific American Fisheries.	2	Ikatan	14
		King Cove	15
San Juan Fishing & Packing Co. (Inc.)	1	Seward	
Sockeye Salmon Co.	1	Morzhovoi Bay	3
Valdez Packing Co.	1	Valdez	4
Western Alaska:			
Alaska Packers Association.	8	Kvichak River (2)	
		Naknek River (3)	
		Nushagak Bay (2)	4
		Ugaguk River	
Alaska-Portland Packers' Association	1	Nushagak Bay	
Alaska Salmon Co.	1	Wood River	
Bristol Bay Packing Co.	1	Kvichak River	
Carlisle Packing Co.	1	Andreafski	
Columbia River Packers' Association.	1	Nushagak Bay	
Everett Packing Co.	1	Herendeen Bay	
Fidalgo Island Packing Co.	1	....do	
Libby, McNeill & Libby	6	Ugaguk River	
		Nushagak Bay (Ekuk)	
		Kvichak Bay	
		Libbyville (Kvichak Bay)	
		Lockanok (Kvichak River)	
		Nushagak	
Midnight Sun Packing Co.	1	Kotzebue	1
Naknek Packing Co.	1	Naknek River	
Nelson Lagoon Packing Co.	1	Nelson Lagoon	5
Northwestern Fisheries Co.	2	Naknek River	
		Nushagak	
Pacific American Fisheries	1	Port Moller	3
Phoenix Packing Co.	1	Herendeen Bay	
Red Salmon Canning Co.	2	Naknek River	
		Ugashik River	

STATISTICS.

The number of salmon canneries in operation in Alaska in 1918 was 135, which is an increase of 17 over 1917. The investment in the salmon-canning industry was $63,901,397, as compared with $46,865,271 in 1917. Of this increase, southeastern Alaska is credited with $9,042,071; central Alaska, $2,547,890; and western Alaska with $5,446,165.

The industry gave employment in 1918 to 26,502 persons, an increase of 3,152. Whites increased 2,312 and Chinese 460. Filipinos are classified separately, there being 1,338 employed in 1918. Natives decreased 90, Japanese 132, and Mexicans 105. The number of miscellaneous persons employed fell off 910, due to the segregation of the Filipinos.

The total pack of canned salmon in Alaska in 1918 was 6,605,835 cases, valued at $51,041,949, being an increase of 658,549 over the 5,947,286 cases packed in 1917 and $4,737,859 over the $46,304,090 value of the pack in 1917. The 1918 pack surpasses all records, in respect to both quantity and value, and shows a gain of 11¾ per cent in production and 10¼ per cent in value. Comparing the pack of 1918 in each district with that of 1917, the following changes are noted: Southeastern Alaska advanced from 3,294,845 to 3,375,445, a gain of 80,600 cases; central Alaska increased from 1,017,206 to 1,391,951, an increase of 374,745 cases; and western Alaska advanced from 1,635,235 to 1,838,439, a gain of 203,204 cases over the pack of 1917. A further comparison shows that cohos advanced from 193,231 to 218,958, a gain of 25,727 cases; chums increased from 906,747 to 1,364,960, an advance of 458,213 cases; humpbacks increased from 2,296,976 to 2,438,954, a gain of 141,978 cases; and reds advanced from 2,488,381 to 2,533,737, an increase of 45,356 cases. The king salmon pack shows a decline from 61,951 to 49,226, a falling off of 12,725 cases from the 1917 pack. This may be attributed to the revival of the mild-cure business, which suffered some setbacks in 1917 on account of the war, and to the larger quantity frozen.

INVESTMENT IN THE SALMON-CANNING INDUSTRY IN 1918.

Items.	Southeast Alaska.		Central Alaska.		Western Alaska.		Total.	
	No.	*Value.*	*No.*	*Value.*	*No.*	*Value.*	*No.*	*Value.*
Canneries operated	76	$5,981,072	29	$2,130,051	30	$4,687,956	135	$12,799,079
Working capital	.....	11,863,980	.....	4,711,101	.....	8,005,510	.....	24,580,591
Wages paid	.....	5,896,473	.....	2,643,610	.....	5,280,985	.....	13,821,068
Vessels:								
Power vessels over 5 tons	342	2,121,425	89	817,880	97	1,988,187	528	4,927,492
Net tonnage	6,165	.....	2,444	.....	6,920	.....	15,529	.....
Launches under 5 tons	163	153,703	148	150,449	37	139,904	348	444,056
Sailing	1	45,000	9	368,500	34	1,624,010	44	2,037,510
Net tonnage	1,974	.....	14,342	.....	51,058	.....	67,374	.....
Barges	3	23,673	.....	.....	.....	.....	3	23,673
Net tonnage	2,295	.....	.....	.....	.....	.....	2,295	.....
Boats, sail and row	1,140	104,711	730	64,702	1,513	269,066	3,383	438,479
Lighters, scows, and house-boats	370	254,960	217	168,958	190	251,836	777	675,654
Pile drivers	54	292,842	40	156,535	29	95,421	123	544,898
Apparatus:								
Haul seines	140	68,330	115	49,868	11	1,410	266	119,608
Fathoms	16,823	.....	17,824	.....	745	.....	35,492	.....
Purse seines	384	285,666	68	34,280	34	47,900	486	367,846
Fathoms	69,120	.....	9,686	.....	9,150	.....	87,956	.....
Gill nets	407	41,748	1,067	112,484	2,656	516,556	4,130	670,788
Fathoms	47,577	.....	80,018	.....	339,032	.....	466,627	.....
Pound nets, driven	286	1,626,951	140	551,813	17	59,386	443	2,238,150
Pound nets, floating	77	210,432	.....	.....	.....	.....	77	210,432
Dip nets	.....	.....	36	450	.....	.....	36	450
Fish wheels	.....	.....	.....	.....	6	1,336	6	1,336
Hand lines	4	160	.....	.....	134	127	138	287
Total	.....	28,971,126	.....	11,960,681	.....	22,969,590	.....	63,901,397

Persons Engaged in the Salmon-Canning Industry in 1918.

Occupations and races.	Southeast Alaska.	Central Alaska.	Western Alaska.	Total.
Fishermen:				
Whites	1,530	1,307	3,296	6,133
Natives	1,507	290	202	1,999
Japanese	.....	1	.....	1
Mexicans	47	.....	.....	47
Miscellaneous [a]	243	.....	.....	243
Total	3,327	1,598	3,498	8,423
Shoresmen:				
Whites	3,339	889	2,014	6,242
Natives	1,561	581	573	2,715
Chinese	1,374	562	798	2,734
Japanese	822	303	339	1,464
Filipinos	731	279	328	1,338
Mexicans	229	229	1,204	1,662
Miscellaneous [a]	129	55	458	642
Total	8,185	2,898	5,714	16,797
Transporters:				
Whites	697	301	221	1,219
Natives	15	24	5	44
Miscellaneous [a]	10	5	4	19
Total	722	330	230	1,282
Grand total:				
Whites	5,566	2,497	5,531	13,594
Natives	3,083	895	780	4,758
Chinese	1,374	562	798	2,734
Japanese	822	304	339	1,465
Filipinos	731	279	328	1,338
Mexicans	276	229	1,204	1,709
Miscellaneous [a]	382	60	462	904
Total	12,234	4,826	9,442	26,502

[a] Porto Ricans, Kanakas, Negroes, etc.

Output of Canned Salmon in 1918.[a]

Product.	Southeast Alaska.		Central Alaska.		Western Alaska.		Total.	
Coho, or silver:	*Cases.*	*Value.*	*Cases.*	*Value.*	*Cases.*	*Value.*	*Cases.*	*Value.*
½-pound flat	22,598	$275,879	3,009	$38,508	631	$8,076	26,238	$322,463
1-pound flat	8,898	79,252	1,227	11,768	2,661	25,545	12,786	116,565
1-pound tall	115,828	1,005,039	55,598	484,996	8,508	75,916	179,934	1,565,951
Total	147,324	1,360,170	59,834	535,272	11,800	109,537	218,958	2,004,979
Chum, or keta:								
½-pound flat	3,559	31,128	.....	.....	.....	.....	3,559	31,128
1-pound flat	2,996	19,094	.....	.....	.....	.....	2,996	19,094
1-pound tall	953,961	5,956,446	300,494	1,900,437	103,950	655,767	1,358,405	8,512,650
Total	960,516	6,006,668	300,494	1,900,437	103,950	655,767	1,364,960	8,562,872
Humpback, or pink:								
½-pound flat	61,128	563,470	2,429	21,902	.....	.....	63,557	585,372
1-pound flat	19,838	133,458	372	2,678	5	33	20,215	136,169
1-pound tall	1,954,417	12,698,557	373,421	2,460,043	27,344	188,315	2,355,182	15,346,915
Total	2,035,383	13,395,485	376,222	2,484,623	27,349	188,348	2,438,954	16,068,456
King, or spring:								
½-pound flat	4,275	53,942	1,561	20,648	164	2,171	6,000	76,761
1-pound flat	2,343	22,852	422	4,160	2,502	32,526	5,267	59,538
1-pound tall	9,738	84,310	13,060	120,361	15,161	144,325	37,959	348,996
Total	16,356	161,104	15,043	145,169	17,827	179,022	49,226	485,295
Red, or sockeye:								
½-pound flat	58,580	761,793	55,765	726,485	22,663	299,150	137,008	1,787,428
1-pound flat	50,849	513,507	41,081	410,810	59,934	591,680	151,864	1,515,997
1-pound tall	106,437	935,597	543,512	4,980,362	1,594,916	14,700,963	2,244,865	20,616,922
Total	215,866	2,210,897	640,358	6,117,657	1,677,513	15,591,793	2,533,737	23,920,347
Grand total	3,375,445	23,134,324	1,391,951	11,183,158	1,838,439	16,724,467	6,605,835	51,041,949

[a] Cases containing ½-pound cans have been reduced one-half in number, and thus, for the purpose of affording fair comparison, all are put upon the basis of forty-eight 1-pound cans per case.

OUTPUT OF CANNED SALMON, 1912 TO 1918.[a]

Product.	1912	1913	1914	1915	1916	1917	1918	Total.
Coho, or silver:	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*
½-pound flat	2,719	3,587	4,579	2,050	13,145	30,412	26,238	82,730
1-pound flat	17	266	285	2,338	8,191	362	12,786	24,245
1-pound tall	163,462	71,926	152,199	119,880	240,573	162,457	179,934	1,090,431
Total	166,198	75,779	157,063	124,268	261,909	193,231	218,958	1,197,406
Chum, or keta:								
½-pound flat	2,795	985	373	.....	1,423	26,760	3,559	35,895
1-pound flat	.....	2,619	5,568	317	.....	2,530	2,996	14,030
1-pound tall	661,838	287,314	667,918	479,629	722,692	877,457	1,358,405	5,045,253
Total	664,633	290,918	663,859	479,946	724,115	906,747	1,364,960	5,095,178
Humpback, or pink:								
½-pound flat	13,712	20,822	2,103	4,325	41,491	91,403	63,557	237,413
1-pound flat	.....	3,258	9,286	3,508	14,796	6,014	20,215	57,077
1-pound tall	1,266,426	1,348,801	974,660	1,867,683	1,681,506	2,199,559	2,355,182	11,693,817
Total	1,280,138	1,372,881	986,049	1,875,516	1,737,793	2,296,976	2,438,954	11,988,307
King, or spring:								
½-pound flat	5,151	1,585	3,143	2,404	2,617	12,973	6,000	33,873
1-pound flat	.....	.....	4,804	3,755	3,804	5,133	5,267	22,763
1-pound tall	38,166	32,785	40,092	82,092	59,452	43,845	37,959	334,391
Total	43,317	34,370	48,039	88,251	65,873	61,951	49,226	391,027
Red, or sockeye:								
½-pound flat	28,024	29,041	53,825	52,033	81,565	124,309	137,008	505,805
1-pound flat	16,242	11,735	64,671	112,847	86,395	89,612	151,864	533,366
1-pound tall	1,856,089	1,924,461	2,083,147	1,765,139	1,936,971	2,274,460	2,244,865	14,085,132
1½-pound nominals	.....	.....	.....	2,293	.....	.....	.....	2,293
2-pound nominals	.....	.....	.....	.....	6,006	.....	.....	6,006
Total	1,900,355	1,965,237	2,201,643	1,932,312	2,110,937	2,488,381	2,533,737	15,132,602
Grand total	4,054,641	3,739,185	4,056,653	4,500,293	4,900,627	5,947,286	6,605,835	33,804,520

[a] The number of cases shown has been put upon the common basis of forty-eigh t 1-pound cans per case.

AVERAGE ANNUAL PRICE PER CASE OF FORTY-EIGHT 1-POUND CANS OF SALMON, 1908 TO 1918.

Product.	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918
Coho, or silver	$3.98	$4.07	$4.89	$5.67	$4.44	$3.45	$4.39	$4.31	$5.34	$8.76	$9.15
Chum, or keta	2.53	2.28	3.04	3.72	2.37	2.21	3.37	2.59	3.34	6.14	6.27
Humpback, or pink	2.69	2.40	3.15	3.94	2.55	2.58	3.50	2.78	3.64	6.44	6.58
King, or spring	4.20	4.32	5.34	6.48	5.37	4.04	5.01	4.63	5.36	10.40	9.85
Red, or sockeye	4.52	4.53	5.30	6.33	5.45	4.54	5.58	5.82	6.04	9.48	9.44

LOSSES AND DISASTERS IN THE SALMON-CANNING INDUSTRY.

The most serious losses in the salmon-canning industry occurred in western Alaska and were occasioned by the unusual ice conditions which prevailed there until June. The ice floes in Bristol Bay were the direct cause of the loss of the ship *Tacoma*, 1,672 tons net, owned by the Alaska Packers Association and valued at $12,500, and of the ship *W. B. Flint*, 746 tons net, belonging to Libby, McNeill & Libby and valued at $35,000. Part of the cargo of the latter vessel was also lost, having a value of $26,360. A number of other cannery vessels sustained minor injuries in the ice. The Bureau's steamer *Roosevelt* extended aid to a number of cannery ships in distress in the ice and rescued 21 men from the *Tacoma* who had been encamped for some time on the ice after the ship sank.

Other losses in western Alaska consisted chiefly of miscellaneous fishing gear, small boats, supplies, and fish, and damages to buildings. The Everett Packing Co. at Herendeen Bay lost $6,000 worth of canned salmon, while its cannery buildings were damaged to the extent of $5,000. Libby, McNeill & Libby lost a scow load of supplies valued at $25,469 and a scow load of fresh salmon worth $14,239. Two small boats, valued at $1,275, and miscellaneous fishing gear, worth $9,454, constitute the remaining losses of the western district. The total losses in western Alaska amounted to $139,297, of which $106,277 was sustained by Libby, McNeill & Libby.

The total losses in central Alaska aggregated $15,452, consisting of small boats, scows, skiffs, and a small quantity of fishing gear.

In southeastern Alaska the two major losses were cannery tenders, one of which, the *Ilwaco*, 41 tons net, belonged to the Alaska Herring & Sardine Co. and was valued at $30,000; the other was owned by the F. C. Barnes Co. and was valued at $15,000. The other losses of the district were small boats valued at $6,225; fishing gear, $2,004; miscellaneous small buildings, $16,407, and fishery products $2,760. The losses in southeastern Alaska reached a total value of $72,396.

In the salmon-canning industry of Alaska there occurred a loss of 12 lives. In southeastern Alaska 1 fisherman was drowned and 4 shoresmen were accidentally killed; in central Alaska, 2 fishermen were drowned, while 1 shoresman was accidentally killed; in western Alaska, 1 fisherman was drowned and 3 shoresmen killed.

No disastrous fires occurred during the year, and had it not been for the extraordinary conditions on Bristol Bay the losses in the salmon-canning industry would have been extremely small. As it was, the losses reported for the whole of Alaska amounted to $227,145.

MILD CURING OF SALMON.

The mild-cured salmon industry in Alaska shows a slight increase in production in 1918 over that of 1917. The pack in 1918 was 3,948 tierces as compared with 3,563 in 1917; all but 40 tierces of the 1918 pack came from southeastern Alaska.

The total number of mild-curers was 17, of which the operations of 10 were incidental to other business, chiefly salmon canning. Those whose business was primarily mild curing are as follows:

Pacific Mild Cure Co.	Waterfall. Port Alexander. Port Conclusion. Three floating plants.
Southern Alaska Canning Co.	Fanshaw.
Vendsyssel Packing Co. (Inc.)	Tyee.
Columbia & Northern Fishing & Packing Co.	Wrangell.
H. R. Thompson	Ketchikan.
Panama Pacific Commercial Co.	Sitka Hot Springs.
M. B. Dahl & Co.	Floating plant.

Minor losses of buildings and wharves valued at $8,000 and fishing gear valued at $4,000 occurred in connection with the mild-cure industry in southeastern Alaska.

INVESTMENT IN THE SALMON MILD-CURING INDUSTRY OF SOUTHEAST ALASKA IN 1918.

Items.	Number.	Value.	Items.	Number.	Value.
Plants	12	$87,294	Gear:		
Operating capital		579,295	Seines, purse	3	$2,850
Vessels:			Fathoms	640	
Power vessels over 5 tons	19	82,505	Seines, beach	5	2,450
Net tonnage	298		Fathoms	460	
Barges	4	8,882			
Net tonnage	202		Total		786,342
Launches under 5 tons	4	2,674			
Boats, sail and row	30	2,392			
Lighters and scows	3	18,000			

PERSONS ENGAGED IN THE SALMON MILD-CURING INDUSTRY OF SOUTHEAST ALASKA IN 1918.

Occupations and races.	Number.	Occupations and races.	Number.
Fishermen:		Shoresmen—Continued.	
Whites	268	Japanese	1
Natives	30	Total	97
Total	298	Transporters: Whites	66
Shoresmen:		Grand total	461
Whites	88		
Natives	8		

PRODUCTS OF THE SALMON MILD-CURING INDUSTRY IN 1918.

Species.	Tierces.	Pounds.	Value.
Southeast Alaska:			
Coho salmon	171	136,800	$16,017
King salmon	3,733	2,986,400	590,402
Red salmon	4	3,200	332
Total	3,908	3,126,400	606,751
Central Alaska: King salmon	40	32,000	1,200
Grand total	3,948	3,158,400	607,951

SALMON PICKLING.

Notwithstanding the larger number of salmon used in the canning industry in 1918, there was a material advance in the production of pickled salmon, represented principally by the larger operations of the companies engaged in salmon canning in western Alaska. The number of salteries decreased, but the investment in the salmon-pickling industry was considerably larger than in 1917. The decrease in plants was due to their conversion into canneries and in some instances to the reclassification of establishments by reason of increased activities along other lines.

Out of a total of 27 salteries, as compared with 37 in 1917, southeastern Alaska is credited with 7, a decline of 6; central Alaska with 9, a decrease of 2, and western Alaska with 11, a falling off of 2. This is a decrease of 10 salteries for Alaska as a whole. The investment in

1918 was $1,362,957, as against $862,399 in 1917, an increase of $500,558. The number of persons employed increased from 509 in 1917 to 815 in 1918.

Alaska produced 56,890 barrels of pickled salmon in 1918, as against 36,390 barrels in 1917. The value of the pack was $1,079,881, an increase over 1917 of $489,384.

The following operators put up considerable quantities of pickled salmon, though in some instances such work was incidental to other more important activities, in which event the latter would govern the classification of the plant elsewhere in this report:

Southeastern Alaska:	
Beauclare Packing Co.	Port Beauclare.
H. Bergman	Ketchikan.
Columbia & Northern Fishing & Packing Co.	Wrangell.
Lisianski Packing Co.	Lisianski Strait.
Southern Alaska Canning Co.	Fanshaw.
Vendsyssel Packing Co.	Tyee.
W. H. Barrington	Wrangell.
Republic Fisheries Co.	Tebenkoff Bay.
Trout Fisheries Co.	Ketchikan.
Central Alaska:	
Northern Fisheries (Inc.)	Kodiak.
Alaska Codfish Co.	Unga.
Ohm Fish & Packing Co.	Sheep Point.
Port Gravina Fishing Co.	Sheep Bay.
Shumagin Packing Co.	Orzinski Bay.
	Squaw Harbor.
Kachemak Saltery & Canning Co.	Swanson Creek.
W. J. Riegel	Uyak.
Western Alaska:	
Alaska Salmon Co.	Kvichak.
Alaska Fishing Co.	Dutch Harbor.
Alaska Packers Association	Ugaguk.
	Kvichak.
	Naknek.
	Nushagak.
Bristol Bay Packing Co.	Koggiung.
Golden Gate Salmon Co.	Kvichak.
Libby, McNeill & Libby	Igushik.
	Koggiung.
	Lockanok.
Naknek Packing Co.	Naknek.
Peter M. Nelson	Kvichak.
Red Salmon Canning Co.	Ugashik.

The only reported losses of property and products in the salmon-pickling industry occurred in central and western Alaska and aggregated $100,548. The losses in the central district were boats valued at $10,370; buildings and wharves, $900; fishing gear, $6,878; and pickled salmon, $4,000; or a total of $22,148. All the losses in the western district were sustained by Peter M. Nelson at the Kvichak saltery, and consisted of 3,300 barrels of pickled salmon, valued at $75,900, and damages to the wharf of $2,500.

Investment in the Salmon-Pickling Industry in 1918.

Items.	Southeast Alaska.		Central Alaska.		Western Alaska.		Total.	
	No.	*Value.*	*No.*	*Value.*	*No.*	*Value.*	*No.*	*Value.*
Salteries	7	$67,190	9	$96,670	11	$106,719	27	$270,579
Operating capital	.....	132,817	.....	227,063	.....	301,196	.....	661,076
Vessels:								
Power vessels over 5 tons	7	44,500	14	74,750	2	20,500	23	139,750
Net tonnage	136	.....	190	.....	29	.....	355	.....
Sailing	.....	.....	.....	.....	6	117,000	6	117,000
Net tonnage	.....	.....	.....	.....	1,560	.....	1,560	.....
Launches under 5 tons	6	4,500	10	10,786	10	15,350	26	30,636
Boats, sail and row	35	6,873	89	7,251	65	13,460	189	27,584
Lighters and scows	4	1,200	17	10,900	8	7,000	29	19,100
Pile drivers	.....	.....	2	1,300	1	2,000	3	3,300
Gear:								
Haul seines	8	2,162	37	11,125	11	750	56	14,037
Fathoms	585	.....	2,574	.....	395	.....	3,554	.....
Purse seines	8	5,600	5	10,000	.....	.....	13	15,600
Fathoms	1,290	.....	880	.....	.....	.....	2,170	.....
Gill nets	3	538	91	5,060	79	8,489	173	14,087
Fathoms	385	.....	2,795	.....	6,555	.....	9,735	.....
Pound nets, driven	1	100	26	35,100	.....	.....	27	35,200
Pound nets, floating	2	12,826	.....	.....	.....	.....	2	12,826
Lines	.....	.....	27	675	10	27	37	702
Dip nets	.....	.....	52	1,480	.....	.....	52	1,480
Total	.....	278,306	.....	492,160	.....	592,491	.....	1,362,957

Persons Engaged in the Salmon-Pickling Industry in 1918.

Occupations and races.	Southeast Alaska.	Central Alaska.	Western Alaska.	Total.
Fishermen:				
Whites	35	119	72	226
Natives	12	34	66	112
Others	.....	2	.....	2
Total	47	155	138	340
Shoresmen:				
Whites	74	174	62	310
Natives	8	56	25	89
Others	1	17	21	39
Total	83	247	108	438
Transporters:				
Whites	3	19	7	29
Natives	.....	5	2	7
Others	.....	1	.....	1
Total	3	25	9	37
Grand total	133	427	255	815

Barrels[a] of Salmon Pickled in 1918, by Species.

Product.	Southeast Alaska.		Central Alaska.		Western Alaska.		Total.	
	No.	*Value.*	*No.*	*Value.*	*No.*	*Value.*	*No.*	*Value.*
Coho, or silver	1,784	$33,739	574	$10,759	143	$2,654	2,501	$47,152
Coho bellies	10	180	.....	.....	.....	.....	10	180
Coho backs	8	80	1	20	.....	.....	9	100
Chum, or keta	2,012	28,326	3,833	52,954	235	3,598	6,080	84,878
Humpback, or pink	5,249	78,778	6,044	93,207	680	10,505	11,973	182,490
Humpback bellies	.....	.....	26	650	.....	.....	26	650
King, or spring	94	1,593	57	1,220	146	4,832	297	7,645
Red, or sockeye	190	3,449	4,731	90,316	31,056	662,426	35,977	756,191
Red bellies	.....	.....	.....	.....	17	595	17	595
Total	9,347	146,145	15,266	249,126	32,277	684,610	56,890	1,079,881

[a] Barrels holding 200 pounds of fish.

SALMON FREEZING.

The entire output of frozen salmon shipped from Alaska in 1918 was prepared in the southeastern district at eight freezing plants, five of which were operated in connection with other fishery enterprises. Those engaged in freezing salmon were as follows:

Henry Goemaere	Washington Bay.
Juneau Cold Storage Co	Juneau.
Booth Fisheries Co	Sitka.
Columbia & Northern Fishing & Packing Co	Wrangell.
Libby, McNeill & Libby	Taku Harbor.
New England Fish Co	Ketchikan.
National Independent Fisheries Co	Ketchikan.
Trout Fisheries Co	Ketchikan.

In 1918 the production of frozen salmon was 1,877,922 pounds, valued at $170,864, being an increase over the output of 1917 of 595,740 pounds and $89,290 in value.

INVESTMENT IN THE FROZEN-SALMON INDUSTRY IN ALASKA IN 1918.

Items.	Number.	Value.
Freezing plants	3	$44,931
Operating capital		57,287
Launches under 5 tons	5	13,374
Boats, sail and row	10	455
Lighters and scows	1	150
Gear:		
Haul seines (450 fathoms)	6	2,400
Purse seines (165 fathoms)	1	1,500
Gill nets (1,050 fathoms)	21	1,575
Pound nets, driven	1	2,500
Total		124,172

PERSONS ENGAGED IN THE FROZEN-SALMON INDUSTRY IN 1918.

Occupations and races.	Number.
Fishermen:	
Whites	34
Natives	10
Shoresmen: Whites	2
Transporters: Whites	4
Total	50

PRODUCTS OF THE FROZEN-SALMON INDUSTRY IN 1918.

Species.	Pounds.	Value.
Coho salmon	458,858	$39,487
Chum salmon	288,786	27,108
Humpback salmon	272,850	9,479
King salmon	709,185	81,777
Red salmon	148,243	13,013
Total	1,877,922	170,864

FRESH-SALMON TRADE.

The fresh-salmon industry in Alaska in 1918 made some advance over that of 1917. Available statistics indicate that 4,260,915 pounds valued at $336,576 were shipped from the Territory in 1918. Production thus increased this year 701,130 pounds, while there was a gain in value of $32,528. To these figures should be added a reasonable quantity of salmon to cover the consumption of these fish in Alaska. By reason of the fewer boats engaged in the commerce of Alaska in 1918 and the reduced population of the Territory, it would be fair to estimate that approximately 500,000 pounds of salmon of all species, valued at $50,000, were consumed locally in Alaska, or considerably less than the estimate for 1917.

The principal shippers of fresh salmon were as follows:

Columbia & Northern Fishing & Packing Co.	Wrangell.
National Independent Fisheries Co.	Ketchikan.
	Juneau.
Pacific Mild Cure Co.	Port Conclusion.
	Waterfall.
	Port Alexander.
Ripley Fish Co.	Petersburg.
	Douglas.
	Wrangell.
	Ketchikan.
H. Bergman.	Ketchikan.
Glacier Fish Co.	Scow Bay.
Whiz Fish Co.	Ketchikan.
San Juan Fishing & Packing Co.	Ketchikan.

INVESTMENT IN THE FRESH-SALMON TRADE OF ALASKA IN 1918.

Items.	Number.	Value.	Items.	Number.	Value.
Operating capital		$35,965	Seines, haul (100 fathoms)	1	$100
Wages paid		15,848	Gill nets (140 fathoms)	4	200
Launches	4	28,400	Pound nets, driven	2	33,876
Rowboats	7	250			
Scows	1	50	Total		114,689

PERSONS ENGAGED IN THE FRESH-SALMON TRADE OF ALASKA IN 1918.

Occupations and races.	Number.
Fishermen: Whites	18
Shoresmen: Whites	13
Transporters: Whites	14
Total	45

PRODUCTS OF THE FRESH-SALMON TRADE OF ALASKA IN 1918.

Species.	Pounds.	Value.	Species.	Pounds.	Value.
Southeast Alaska:			Central Alaska:		
Coho salmon	824,810	$40,795	Coho salmon	600	$60
Chum salmon	448,332	13,813	Chum salmon	1,560	15
Humpback salmon	546,069	24,430	Red salmon	28,750	511
King salmon	2,111,938	231,619			
Red salmon	298,856	25,333	Total	30,910	586
Total	4,230,005	335,990	Grand total	4,260,915	336,576

DRY SALTING OF SALMON.

The dry salting of salmon in Alaska is a business of comparatively slight importance, being limited to the activities of a few operators in southeastern and western Alaska. In the southeastern district the F. C. Barnes Co., at Lake Bay, dry salted a small quantity of coho salmon, and A. H. Humphries, operating a floating plant, prepared in like manner a few thousand pounds of humpback salmon. In the western district the Kuskokwim Fishing & Transportation Co., at Apokak, dry salted a considerable quantity of coho, chum, king, and red salmon, and the Carlisle Packing Co., at Andreafski, similarly prepared a limited quantity of cohos and chums.

INVESTMENT IN THE DRY-SALTING SALMON BUSINESS IN ALASKA IN 1918.

Items.	Number.	Value.	Items.	Number.	Value.
Plants		$10,000	Barges	1	$2,000
Operating capital		15,000	Purse seines (140 fathoms)	1	5,000
Wages paid		16,700	Gill nets (1,560 fathoms)	39	4,000
Launches	2	1,750			
Rowboats	17	895	Total		58,345
Scows	1	3,000			

PERSONS ENGAGED IN THE DRY-SALTING SALMON BUSINESS IN 1918.

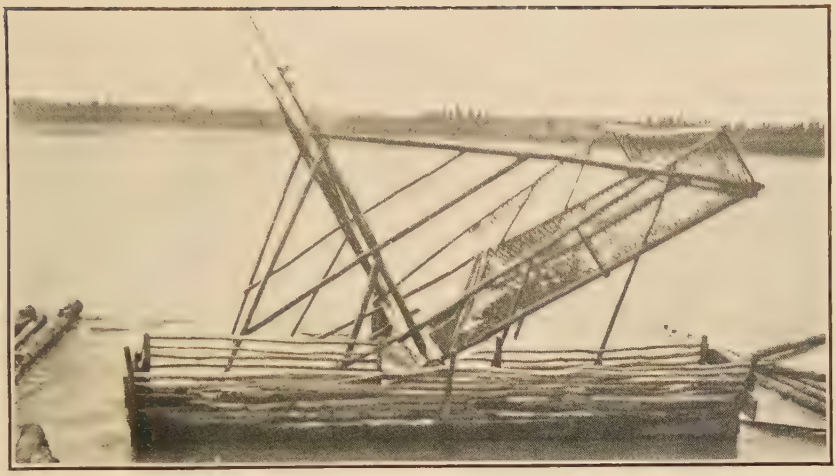
Occupations and races.	Number.
Fishermen:	
Whites	22
Natives	47
Total	69
Shoresmen: Whites	4
Transporters: Whites	3
Grand total	76

PRODUCTS OF THE DRY-SALTING SALMON BUSINESS IN ALASKA IN 1918.

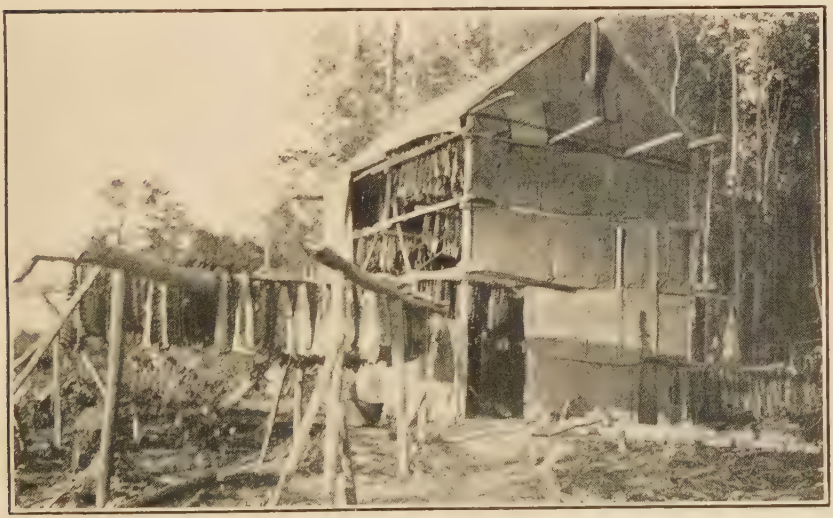
Species.	Pounds.	Value.
Southeast Alaska:		
Coho salmon	3,000	$300
Humpback salmon	15,600	1,170
Total	18,600	1,470
Western Alaska:		
Coho salmon	312,560	30,916
Chum salmon	95,085	8,193
King salmon	61,845	4,366
Red salmon	28,885	2,599
Total	498,375	46,074
Grand total	516,975	47,544

DRYING AND SMOKING OF SALMON.

As a commercial undertaking the drying and smoking of salmon for export appears to have been discontinued. It is noted elsewhere in this report, however, that a considerable quantity of salmon was dried by the whites and natives of the Yukon River region. A conser-



NATIVE SALMON WHEEL, YUKON RIVER.



NATIVE METHOD OF CURING SALMON, YUKON RIVER, 1918.

vative estimate indicates that 500,000 pounds of coho, 500,000 pounds of chum, and 400,000 pounds of king salmon were dried for use in the interior of Alaska, thus making a total of 1,400,000 pounds, valued at $140,000. This product is used chiefly as food for the natives and their dogs.

According to careful estimates, the investment in this business consists of 393 fish wheels, valued at $19,650, and 130 gill nets, aggregating 3,250 fathoms, valued at $6,500, or a total of $26,150.

SALMON BY-PRODUCTS.

The utilization of offal and other waste material at the salmon canneries in Alaska in the manufacture of oil, fish meal, and fertilizer was carried on by the Fish Canners By-Products Co., at Ward Cove, and the Pacific American Fisheries, at Excursion Inlet and Ikatan, the latter plant being new in 1918.

The industry shows an investment in 1918 of $109,782, which is an increase of $1,629 over 1917. Employment was given to 20 men, 45 less than the number employed in 1917. The value of the products was $40,047, as compared with $61,873 in 1917. This decline is due chiefly to the lessened production of oil, the falling off being 20,526 gallons.

Output of By-Products Industry in Alaska in 1918.

Items.	Quantity.	Value.
Oil.....gallons..	4,624	$4,624
Fertilizer.....tons..	684	35,423
Total.....	.....	40,047

HALIBUT FISHERY.

For many years the halibut fishery has been second in importance to the salmon industry. In 1918, however, the great activity in the herring fishery placed it next in importance to the salmon, thus putting the halibut in third place. A great increase occurred in the herring industry, while the halibut fishery showed but a slight increase.

The total catch of halibut from Pacific waters in 1918 was considerably less than that of the previous year, due chiefly to withdrawals of men and vessels on account of the war. There is a slight increase, however, in the figures compiled by the Bureau in respect to the yield of halibut from the Alaskan banks. Because of difficulties in securing statistical information as to the exact source of the halibut catches, it has been necessary to make certain estimates in respect to investment and production credited to Alaska. It is believed, however, that the figures are so nearly correct as to be acceptable for all practical purposes.

At a number of sessions of the Canadian-American Fishery Conference consideration was given the halibut fishery of the Pacific coast and Alaska. Details in respect thereto appear on page 21 in this report.

STATISTICAL SUMMARY.

The halibut industry in Alaska shows an investment of $2,594,292 in 1918 as compared with $2,200,987 in 1917, an increase of $393,305, which amount is due to the enhanced value of all vessels on account of war conditions. The number of persons employed was 1,186, an increase of 277 over the number reported in 1917. The products of this fishery totaled 13,869,706 pounds of halibut, valued at $1,667,686. This is an increase of 716,295 pounds over the production of 1917, while the value of products increased $547,460.

The principal operators in the halibut industry were the Booth Fisheries Co., at Sitka; Glacier Fish Co., at Scow Bay; Marathon Fishing & Packing Co., at Petersburg, where the barge *Amelia* was used as a floating plant; National Independent Fisheries Co., at Juneau and Ketchikan; New England Fish Co., at Ketchikan; Ripley Fish Co., at Douglas, Ketchikan, Petersburg, and Wrangell; Whiz Fish Co., at Ketchikan; and the San Juan Fishing & Packing Co., at Seward.

INVESTMENT IN THE ALASKA HALIBUT FISHERY IN 1918.

Items.	Number.	Value.	Items.	Number.	Value.
Fishing vessels:			Fishing vessels—Continued.		
Steamer and gas	118	$1,536,100	Dories and scows	264	$16,850
Tonnage	2,270		Fishing apparatus		44,910
Launches	4	4,300	Shore and fixed property		292,132
Outfit		700,000			
			Total		2,594,292

PERSONS ENGAGED IN THE ALASKA HALIBUT FISHERY IN 1918.

Races.	Number.
Whites	1,183
Natives	3
Total	1,186

PRODUCTS OF THE ALASKA HALIBUT FISHERY IN 1918.

Products.	Pounds.	Value.
Fresh (including local)	10,491,777	$1,315,985
Frozen	3,337,529	348,866
Dry salted	40,400	2,835
Total	13,869,706	1,667,686

COD FISHERY.

The cod fishery of Alaska maintains a remarkably uniform production year after year. Approximately two-thirds of the catch of cod is made in Bering Sea, while the remainder is taken chiefly off the southern shore of the Alaska Peninsula. The fleet of vessels annually visiting the cod banks of western Alaska changes but little as the seasons pass. In 1918 the catch in Bering Sea was somewhat less

than in 1917, but the shore-station catch during the winter was, in round numbers, 1,000,000 pounds more than in the 1917 season, which was sufficient to offset the shortage in the vessel fishing.

The demand for cod was strong throughout the year in this country, leaving only a small quantity available for export. The condition of the market was such that several hundred tons of Japanese-caught cod were landed at San Francisco.

VESSEL FISHERY.

No changes are noted in the companies engaged in the vessel cod fishery of Alaska in 1918 or in the total number of vessels in the cod fleet. Some of the vessels which have been listed for years as being engaged in this fishery do not appear in the present fleet, as they were employed in the trans-Pacific commerce, where under present conditions high charter rates are obtainable. Other vessels, however, were added to the fleet to take the place of those operating in the offshore trade. The *Galilee*, owned by the Union Fish Co., returned from a voyage to foreign waters in time to sail for Bering Sea on April 26 under charter to the Northern Fisheries (Inc.). The *S. N. Castle* (464 tons net), belonging to the Alaska Codfish Co., and the *Fanny Dutard* (252 tons net), owned by J. A. Matheson, were engaged in foreign commerce during the year and did not go to Alaska. The *Vega* (223 tons net), operated by the Union Fish Co. in 1917 on a fishing voyage to Alaska, was sold in the fall of that year. The Union Fish Co. increased its fleet by the addition of two vessels, the *Beulah* and the *Louise*, of 339 and 328 tons net, respectively. The Alaska Codfish Co. sent three power schooners to Alaska for work in connection with the shore stations, the *Alasco I* (23 tons net), *Alasco II* (5 tons net), and the *Alasco III* (8 tons net). Each made the voyage from San Francisco to Alaska under its own power in from 15 to 20 days, a remarkable achievement for such small vessels.

ALASKA COD FLEET IN 1918.

Names.	Rig.	Net tonnage.	Operators.
City of Papeete	Schooner	370	Alaska Codfish Co., San Francisco, Calif.
Glendale	do	281	Do.
Allen A	do	266	Do.
Maweema	do	392	Do.
Alasco I	Power schooner	23	Do.
Alasco II	do	5	Do.
Alasco III	do	8	Do.
Azalea	Schooner	327	J. A. Matheson, Anacortes, Wash.
Alice	Power schooner	15	Northern Fisheries (Inc.), Anacortes, Wash.
Valdez	do	10	Do.
Charles Brown	Schooner	64	Do.
John A	do	235	Pacific Coast Codfish Co., Seattle, Wash.
Charles R. Wilson	do	328	Do.
Maid of Orleans	do	171	Do.
Alice	do	220	Robinson Fisheries Co., Anacortes, Wash.
Wawona	do	431	Do.
Golden State	Power schooner	223	Union Fish Co., San Francisco, Calif.
Sequoia	Schooner	324	Do.
Galilee[a]	do	328	Do.
Beulah	do	339	Do.
Louise	do	328	Do.
Martha	do	14	Do.
Pirate	Power schooner	30	Do.
Union Flag	do	10	Do.

[a] Chartered to Northern Fisheries (Inc.) in 1918.

SHORE STATIONS.

Four companies in southeastern Alaska handled small quantities of cod in connection with other fishery business. They were the Booth Fisheries Co., at Sitka; Libby, McNeill & Libby, at Taku Harbor; New England Fish Co., at Ketchikan; and the Ripley Fish Co., at Douglas, Ketchikan, and Petersburg. In central Alaska there were 15 operators, the important ones being the Alaska Codfish Co., with stations at Unga, Kelleys Rock, and Delarof Harbor on Unga Island, Companys Harbor and Murphys Cove on Sannak Island, Dora Harbor on Unimak Island, and one station on Nagai Island; Shumagin Packing Co., at Squaw Harbor on Unga Island; Northern Fisheries (Inc.), at Kodiak; and the Union Fish Co., at Pirate Cove on Popof Island, Unga on Unga Island, Northwest Harbor on Herendeen Island, Pavlof Harbor on Sannak Island, and Dora Harbor on Unimak Island. In western Alaska cod were put up incidentally at 11 shore stations operated by companies engaged chiefly in other lines of fishery business. In this connection mention may be made of the Akutan Codfish Co., at Akutan; Nelson Lagoon Packing Co., at Nelson Lagoon; and the Unalaska Atkafish Co., at English Bay.

The most notable development in the cod fisheries of central Alaska occurred at Kodiak, where the Northern Fisheries (Inc.) established a shore station and caused some local activity by bringing in a few experienced fishermen, whose success in fishing the adjacent waters was sufficient to induce several natives and white men residing at Kodiak to also engage in cod fishing. Operations were necessarily restricted to inland waters, as no suitable vessels were available for offshore work.

There is a great difference in the quality of cod taken from the various localities in this region. Sycamore Bay produces the best and largest fish, but it is easily fished out—that is, there may be a month of good fishing followed by one when no fish can be taken, then in the next month the catch will again be better. This disappearance of the cod is not understood unless it is due to temporary exhaustion of the food supply. As the food is replenished, the fish return. Some of the cod taken in this bay are equal in both size and quality to those caught in Bering Sea, individuals weighing 30 pounds or more being secured. As a rule, however, cod from these inland waters are rather undersized, many being accepted only at half price by the company.

A total of 2,336 cases of canned cod were packed by the Pacific American Fisheries at its Port Moller cannery and the Nelson Lagoon Packing Co. at Nelson Lagoon.

STATISTICAL SUMMARY.

The Alaska codfish industry shows an investment of $1,271,118 in 1918, which is a decrease of $137,147 from the investment in 1917. A total of 697 persons were employed, as compared with 795 in 1917.

This fishery produced a total of 14,062,960 pounds of cod, valued at $957,184. This is an increase of 285,490 pounds in production and $212,208 in value.

INVESTMENT IN THE COD FISHERY IN ALASKA IN 1918.

Items.	Number.	Value.	Items.	Number.	Value.
Value of shore stations		$169,952	Vessels—Continued.		
Cost of operations		332,743	Rowboats	483	$22,395
Wages paid		430,426	Pile drivers	2	250
Vessels:			Gear:		
Power vessels over 5 tons	11	94,364	Seines (341 fathoms)	5	700
Net tonnage	427		Gill nets (54 fathoms)	2	90
Launches under 5 tons	18	2,156	Lines	2,129	2,242
Sailing vessels	15	215,800			
Net tonnage	4,336		Total		1,271,118

PERSONS ENGAGED IN THE ALASKA COD FISHERY IN 1918.

Occupations and races.	Number.	Occupations and races.	Number.
Fishermen:		Transporters:	
Whites	474	Whites	138
Natives	50	Natives	4
Total	524	Total	142
Shoresmen: Whites	31	Grand total	697

PRODUCTS OF ALASKA COD FISHERY IN 1918.

Products.	Pounds.	Value.	Products.	Pounds.	Value.
Vessel catch:			Canned:		
Dry salted cod	8,204,500	$590,370	In 1-pound flats (2,336 cases)	112,128	$14,175
Pickled cod	996,459	48,333			
Tongues	17,600	1,760	Total:		
Frozen cod	239,138	6,894	Dry salted cod	10,902,507	778,737
Total	9,457,697	647,357	Pickled cod	2,650,073	142,200
Shore-station catch:			Stockfish	38,268	7,128
Dry salted cod	2,698,007	188,367	Tongues	18,800	1,840
Pickled cod	1,653,614	93,867	Frozen cod	273,326	10,312
Stockfish	38,268	7,128	Fresh cod	67,458	2,742
Tongues	1,200	80	Canned	112,128	14,175
Frozen cod	34,188	3,418	Oil (50 gallons)	400	50
Fresh cod	67,458	2,742			
Total	4,492,735	295,602	Total	14,062,960	957,184

HERRING FISHERY.

The Government was successful in its efforts to introduce the Scotch method of curing herring into Alaska in 1917. A comparatively small pack was made, but the demonstrations of the method of cure under the immediate direction and supervision of Aug. H. D. Klie attracted considerable attention to the end that in 1918 several packers were prepared to follow that method. In 1917 the market for Scotch-cured herring remained firm throughout the year. The Norwegian-cured product was not in the same demand and packers who employed that cure experienced some difficulty in disposing of their herring.

Before operations began in 1918, Mr. Klie revised his published directions regarding the Scotch cure to suit conditions in Alaska and to stimulate more interest in that method. The Government continued the work it began in 1917 by again sending Assistant Clarence L. Anderson and Fishery Expert William P. Studdert to central Alaska to give instruction in curing and packing herring by the Scotch formula. During the summer they rendered valuable

assistance to the Ohm Fish & Packing Co., at Sheep Point, and to the Carlisle Packing Co., Franklin Packing Co., and Haynes Fisheries, all three plants being at Port Ashton or Sawmill Bay. Late in the year Mr. Studdert went to Halibut Cove, where some 15 operators were engaged in packing herring, three of whom, the Kachemak Saltery & Canning Co., the Alaska Sea Food Products Co., and Keith McCullough, were interested in and made considerable packs of Scotch-cured herring.

When the 1918 pack began to arrive in Seattle, it was found that in several instances packers had been careless in their work, and that a faulty product which could hardly be marketed was the result. This carelessness manifested itself in poor and loose packing, insufficient salting, oversalting, and improper grading. Packers were therefore notified that herring branded as Scotch cured must meet certain known requirements in order to be acceptable to the trade and comply with the provisions of the pure food and drug act in regard to branding. Consideration is being given to an inspection service under Government auspices to pass upon the quality of herring landed at Seattle.

The great expansion of the herring industry in Alaska as a direct consequence of the exploitation work of 1917 in introducing the Scotch cure extended also to the operations of packers who preferred to follow the Norwegian cure, as increased activities in the one direction also stimulated production in the other.

Herring fishing in southeastern Alaska and in the Prince William Sound district of central Alaska is principally by means of purse seines. Fish of all sizes are thus taken. Since there are limitations upon the size of herring which may be pickled for food, it naturally follows that a considerable quantity of small fish are taken which can not be used and are therefore thrown away. In the aggregate thousands of barrels of herring are thus destroyed. Where herring are taken in purse seines it would seem that this loss is unavoidable unless they are impounded, thus enabling the removal and segregation, by gill netting in the pounds, of those of proper sizes for pickling. The small fish would pass through the nets and could be released after the larger ones are removed. The practicability of this manner of sorting herring has not been demonstrated successfully as yet, but experienced herring operators raise no special objection thereto where herring are held in bights or small coves. Herring are taken in Halibut Cove with gill nets. By using nets of proper mesh, the taking of small fish is reduced to a minimum. Probably very little waste occurs here as the herring are uniformly large in the locality.

STATISTICAL SUMMARY.

The herring industry of Alaska shows an investment of $1,802,817 in 1918, as compared with $562,002 in 1917, or a gain of 220 per cent. The number of persons employed was 884, as compared with 214 in 1917. The value of the products was $1,819,538, as against $767,729, an increase of $1,051,809 over 1917. This shows a material development of the herring fishery of Alaska. It is especially interesting to note that the chief product was the Scotch-cured herring, of which the equivalent of 38,977 full Scotch barrels, or 9,744,175 pounds, was packed. The pack of Norwegian-cured herring exceeds all previous records, a total of 8,968,515 pounds, or the equivalent of 49,842 barrels, having been produced in 1918.

Losses in the herring industry were comparatively small. A launch valued at $8,000 and a barge valued at $4,000 were lost by the Kachemak Saltery & Canning Co. Miscellaneous small boats, gear, and supplies, valued at $2,179, and herring products valued at $8,459, were also lost. The total losses were therefore $22,638.

INVESTMENT IN THE HERRING FISHERY IN ALASKA IN 1918.

Items.	Southeast Alaska.		Central Alaska.		Western Alaska.		Total.	
	No.	*Value.*	*No.*	*Value.*	*No.*	*Value.*	*No.*	*Value.*
Plants operated	9	$238,496	25	$188,008	2	$6,800	36	$433,304
Operating capital	.....	516,993	.....	357,178	.....	39,722	.....	913,893
Vessels:								
Power vessels over 5 tons	24	134,000	14	80,300	1	6,500	39	220,800
Net tonnage	478	.....	264	.....	11	.....	753	.....
Barges	1	7,000	3	13,000	.....	.....	4	20,000
Launches under 5 tons	4	4,000	16	24,400	1	250	21	28,650
Boats, row and seine	40	2,955	75	5,485	20	1,737	135	10,177
Lighters and scows	14	33,250	26	14,900	1	300	41	48,450
Pile drivers	2	1,500	1	1,000	.....	.....	3	2,500
Gear:								
Haul seines	18	23,800	16	12,396	2	530	36	36,726
Fathoms	1,839	.....	1,810	.....	200	.....	3,849	.....
Purse seines	32	55,000	6	16,500	4	2,520	42	74,020
Fathoms	4,505	.....	1,410	.....	400	.....	6,315	.....
Gill nets	10	300	69	5,968	162	3,929	241	10,197
Fathoms	500	.....	3,030	.....	2,593	.....	6,123	.....
Dip nets	3	600	.....	.....	.....	.....	3	600
Pound nets, floating	2	500	.....	.....	.....	.....	2	500
Pots	.....	.....	5	2,500	.....	.....	5	2,500
Skates	.....	.....	7	500	.....	.....	7	500
Total	.....	1,018,394	.....	722,135	.....	62,288	.....	1,802,817

PERSONS ENGAGED IN THE ALASKA HERRING FISHERY IN 1918.

Occupations and races.	Southeast Alaska.	Central Alaska.	Western Alaska.	Total.
Fishermen:				
Whites	121	115	8	244
Natives	1	4	19	24
Others	9	.....	.....	9
Total	131	119	27	277
Shoresmen:				
Whites	306	176	3	485
Natives	2	12	59	73
Others	8	16	.....	24
Total	316	204	62	582
Transporters: Whites	12	13	.....	25
Grand total	459	336	89	884

PRODUCTS OF ALASKA HERRING FISHERY IN 1918.

Products.	Quantity.	Value.
Herring:		
Canned (1-pound cans) ..... cases	31,719	$231,735
Dry salted for food ..... pounds	100,000	1,500
Fresh for food ..... do	606,326	6,564
Fresh for bait ..... do	1,407,200	17,827
Frozen for bait ..... do	4,152,835	36,654
Pickled for food, Scotch cure ..... do	9,744,175	748,606
Pickled for food, Norwegian cure ..... do	8,968,515	632,402
Oil ..... gallons	138,012	97,000
Fertilizer ..... tons	645	47,250
Total	.....	1,819,538

WHALE FISHERY.

SHORE STATIONS.

The whaling industry in Alaska is represented by the operations of three companies, namely, the United States Whaling Co., at Port Armstrong, the North Pacific Sea Products Co., at Akutan, and the Beluga Whaling Co., on the Beluga River.

The United States Whaling Co. operated one less steamer in whale killing than heretofore, only the *Star II* and *Star III* (97 tons each) being engaged. The North Pacific Sea Products Co. increased its whaling fleet by the addition of one vessel, the steamer *Paterson* (77 tons), thus making four steamers engaged in whale killing, the other three being those used in 1917, the *Kodiak* and *Unimak* (99 tons each), and the *Tanginak* (71 tons). The power schooner *Halcyon* (61 tons) was also used. In addition to the barge *Fresno* (1,149 tons), the steamer *Elihu Thompson* (448 tons) was used as a transporting and refrigerating vessel.

The *Halcyon* was lost in November by being blown to sea from her moorings in the harbor at Akutan. No one was aboard the vessel. It was valued at $10,000. Buildings valued at $5,000 were also destroyed.

STATISTICAL SUMMARY.

The whaling industry in Alaska in 1918 shows an investment of $1,350,971, a decrease of $258,955 from 1917. It gave employment to 325 persons as compared with 262 in 1917. Products valued at $834,127 were obtained, which is an increase of $179,255 over 1917. The total number of whales taken was 448, which is 25 more than the number obtained in 1917.

PRODUCTS OF ALASKA SHORE WHALING OPERATIONS IN 1918.

Products.		Quantity.	Value.
Whale oil	gallons	672,989	$421,942
Sperm oil	do	338,931	327,420
Fertilizer, meat	pounds	1,698,000	66,845
Fertilizer, bone	do	361,600	7,410
Whalebone	do	8,223	1,644
Ivory, sperm	do	866	216
Meat, frozen	do	148,000	7,400
Hides, beluga	do	2,500	1,250
Total			834,127

WHALES TAKEN IN SHORE OPERATIONS IN 1918.

Species.	Number.	Species.	Number.
Finback	170	Sei	4
Humpback	58	Beluga	42
Sulphur-bottom	82		
Sperm	92	Total	448

INVESTMENT IN SHORE WHALE FISHERY IN ALASKA IN 1918.

Items.	Number.	Value.	Items.	Number.	Value.
Vessels:			Vessels—Continued.		
Steam and gas	8	$420,000	Pile driver	1	$150
Net tonnage	1,049		Value of plants		326,545
Barge	1	30,000	Cash capital		314,933
Net tonnage	1,149		Wages paid		256,983
Launches under 5 tons	2	1,900			
Rowboats	2	60	Total		1,350,971
Scows	2	400			

PERSONS ENGAGED IN THE SHORE WHALE FISHERY IN ALASKA IN 1918.

Races.	Number.
Whites	246
Natives	36
Japanese	43
Total	325

CLAM FISHERY.

Clam canning in Alaska in 1918 was carried on by seven companies, four of which, the Alaska Clam Canning Co., Petersburg, Noyes Island Packing Co., Steamboat Bay, Sitka Packing Co., Sitka, and the Red Cross Packing Co., Juneau, were located in southeastern Alaska, while the other three, the Lighthouse Canning Co., Pioneer Packing Co., and the Pinnacle Rock Packing Co., were in central Alaska, at or near Cordova, where most of the clam pack was made. Clam canning in southeastern Alaska, except by the Red Cross Packing Co., was incidental to salmon canning. In central Alaska the Pioneer Packing Co. and the Pinnacle Rock Packing Co. engaged exclusively in clam canning, but the Lighthouse Canning Co. entered the salmon-canning business. It is probable that similar action will be taken by the other companies, as they admit that the clam beds are approaching serious depletion, which in another year or so will have reached a point where profitable digging can not be carried on.

The Alaska Sea Food Co.'s plant near Cape Whitshed was built primarily as a clam cannery. Canning began in 1917, but the plant was burned early in the season and was not rebuilt in time to resume operations that year. In 1918 it opened as a salmon cannery.

This industry shows an investment of $247,757, which is a decrease of $47,230 from 1917. It gave employment to 182 persons, or 44 less than in 1917. A total of 43,575 cases were packed as against 74,515 cases in 1917. The value of clam products was $214,504, as compared with $274,036 in 1917, a decrease of $59,532.

INVESTMENT IN THE CLAM-CANNING INDUSTRY IN ALASKA IN 1918.

Items.	Number.	Value.
Canneries operated	3	$56,200
Working capital		82,367
Wages paid		92,830
Vessels:		
Over 5 tons	1	6,000
Tonnage	25	
Launches under 5 tons	15	7,042
Rowboats and skiffs	53	2,499
Lighters and scows	1	819
Total		247,757

PERSONS ENGAGED IN THE CLAM-CANNING INDUSTRY IN ALASKA IN 1918.

Occupations and races.	Number.
Diggers: Whites	107
Shoresmen: Whites	72
Transporters: Whites	3
Total	182

PRODUCTS OF CLAM CANNERIES IN ALASKA IN 1918.

Products.	Cases.	Value.
Clams:		
½-pound cans (48 per case)	18,240	$88,698
10-ounce cans (48 per case)	150	600
12-ounce cans (48 per case)	1,797	8,500
1-pound cans (48 per case)	21,684	109,174
2-pound cans	1,487	6,894
10-pound cans (6 per case)	125	500
Clam juice:		
10-pound cans (6 per case)	92	138
Total	43,575	214,504

MINOR FISHERIES.

TROUT.

The trout fishery of Alaska has not attracted much attention although it is of growing importance. One concern, the Midnight Sun Packing Co., at Kotzebue, reports that its major operations consisted of the catching and packing of Dolly Varden trout. This company canned 2,587 cases of trout, the value of which was $24,105, or more than the value of all the trout products of Alaska in 1917. There was also a considerable increase in the quantity of fresh and frozen trout produced, the records for 1918 showing an aggregate production of 69,718 pounds, valued at $7,343, as against 42,966 pounds, valued at $4,018, in 1917. This increase occurred chiefly in southeastern Alaska. The total production of pickled trout was 105 barrels, as against 174 barrels in 1917. The total value of all trout products in 1918 was $33,684, an increase of $16,788 over the yield of 1917.

PRODUCTS OF THE ALASKA TROUT FISHERY IN 1918.

Section and species.	Fresh.		Frozen.		Pickled.		Canned.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Barrels.*	*Value.*	*Cases.*	*Value.*
Southeast Alaska:								
Dolly Varden	47,169	$5,725	985	$197	3	$95	.....	.....
Steelhead	13,049	850	675	101	8	112	.....	.....
Total	60,218	6,575	1,660	298	11	207	.....	.....
Central Alaska:								
Dolly Varden	.....	.....	7,840	470	74	1,236	33	$295
Steelhead	.....	.....	.....	.....	.....	.....	21	168
Total	.....	.....	7,840	470	74	1,236	54	463
Western Alaska:								
Dolly Varden	.....	.....	.....	.....	20	330	2,587	24,105
Grand total	60,218	6,575	9,500	768	105	1,773	2,641	24,568

SABLEFISH.

The sablefish, or black cod, as it was once known, is taken incidentally by those engaged in halibut fishing on the offshore banks of Alaska. The bulk of the catch was marketed fresh or frozen, while a small quantity was pickled. The yield was 1,336,039 pounds, or 315,549 pounds more than in 1917. The products in 1918 were valued at $67,351, as compared with $38,303 in 1917, a gain of $29,048.

SHIPMENTS OF SABLEFISH FROM ALASKA WATERS IN 1918.

Condition.	Pounds.	Value.
Fresh	842,386	$41,122
Frozen	411,955	20,004
Pickled	81,698	6,225
Total	1,336,039	67,351

RED ROCKFISH.

The production of red rockfish in 1918 was 338,669 pounds, valued at $12,186, as compared with 150,453 pounds in 1917, valued at $3,696. This was a very gratifying increase in the take and utilization of this somewhat neglected fish. The rockfish, as in the case of several other species of fish, does not support an independent industry, but is taken chiefly in connection with the halibut fishery.

CRABS.

Commercially, the crabs of Alaska attract little attention, although they are recognized as a superior sea food, widely distributed, and reasonably abundant. The only reported crab fishery was carried on by John Murphy, at Tenakee, Alaska, who took 720 dozen, valued at $1,440. The total investment in this industry was $739. Crabs are used to a very considerable extent by local residents of various parts of Alaska.

SHRIMPS.

The shrimp fishery of Alaska is centered in the Petersburg region and at Thomas Bay. The Glacier Fish Co., at Scow Bay, the Ripley Fish Co., at Petersburg, and H. Van Vlack & Co., at Thomas Bay, handled shrimps. The latter concern, in addition to dealing in fresh shrimps as the other companies did, canned 524 cases, valued at $3,200. The total sales of fresh shrimps were 48,204 pounds, valued at $10,803. The total value of the shrimp products of Alaska in 1918 was $14,006.

MISCELLANEOUS FISHERY PRODUCTS.

In the various fishery operations in Alaska certain species of fish are taken and used to a limited extent by the companies handling fresh and frozen fish. These miscellaneous products are not given separate classification, but consist in large part of ling cod, flatfish, and pollock, the total yield being 246,968 pounds, valued at $7,696. In addition to this, 7,850 pounds of atkafish, valued at $645, were pickled in western Alaska.

MINOR FUR-BEARING ANIMALS.

FIELD WORK.

The work of enforcing the law and regulations for the protection of fur-bearing animals in Alaska in 1918 was carried on by representatives of the Bureau in the usual manner. The greatly increased activities in connection with the fisheries demanded much of the time of field employees, but all the attention possible was devoted to matters pertaining to the minor fur-bearing animals. Two wardens in the interior of Alaska and one special fur warden have given particular attention to fur work.

Through a reciprocal arrangement with the Governor of Alaska, employees of this Bureau have been appointed ex officio game wardens, and the territorial game wardens and special employees for the suppression of the liquor traffic among the Indians have been designated special wardens in the Alaska service of the Bureau of Fisheries without additional compensation. This increases the Bureau's personnel in Alaska by 11 members, as follows:

Game wardens: Patrick Hamilton, Ketchikan; J. C. Lund, Juneau; P. S. Ericksen, McCarthy; J. A. Baughman, Seward; Stephen Foster, Nenana; R. E. Steel, Eagle; and M. O. Colberg, Nome.

Special employees: J. F. McDonald, Juneau; J. A. Bourke, Valdez; Thomas P. Killeen, Nome; and John A. Moe, Ruby.

Game Warden F. A. Martin, at Anchorage, had already been appointed a special fur warden at a nominal salary to succeed a former employee of similar status.

This arrangement was completed in July and assistance has been given chiefly in the matter of reporting violations of the law and regulations, and making seizures of illegally taken skins.

REGULATIONS.

In the main the regulations remained the same as in 1917. The prohibition in respect to the taking of marten in Alaska continued in force. The prohibition as to the taking of beaver was extended until November 1, 1923. The situation in regard to the shipment of beaver and marten skins from Alaska has not been considered altogether satisfactory on account of the number of skins of both species which are declared to have been procured in Canada. It is possible that the regulations are thus evaded in some cases. The desirability of having similar regulations put in effect by the Canadian authorities is being considered, as it is believed that where depletion has occurred in Alaska the same condition probably exists in the contiguous Provinces of Canada.

Seasons for the taking of wild fur-bearing animals were unchanged, with the exception that in the region drained by streams flowing into the Arctic Ocean north of the sixty-eighth parallel of north latitude the open season for taking foxes was extended 30 days, to include April 14 of each year. This change was made on the recommendation of the Governor of Alaska. It was advocated by Archdeacon Stuck and Dr. V. Stefansson, who have a thorough knowledge of conditions

BUREAU'S ALASKA FUR WARDEN AND DOG TEAM, YUKON RIVER.

FOX CORRALS AND BREEDING PENS, CENTRAL ALASKA.

in the far northern part of Alaska. T. L. Richardson, Government teacher and United States commissioner at Barrow, Alaska, also urged this extension of the season. The killing of any fur-bearing animal for which a close season exists is prohibited if its fur is unprime.

A regulation has also been issued to prohibit the use of dogs in the taking of fur-bearing animals. This was deemed necessary, because of the custom, particularly in the Kodiak region, of pursuing foxes with dogs. It is reported that a hound will run down a fox in a very few minutes, and, if the hunter does not quickly catch up with the dog, the fox will soon be so mangled as to greatly reduce the value of the pelt or even render it practically worthless.

The regulation regarding the use of dogs was promulgated September 18, 1918, as follows:

Dogs.—The use of dogs for pursuing and killing fur-bearing animals for which close seasons exist is prohibited.

On September 24, 1918, the following regulation in respect to foxes was approved:

Fox.—The killing of any fox is prohibited throughout the season from March 15 to November 15, both days inclusive, of each year; except that in the region drained by streams flowing into the Arctic Ocean north of the sixty-eighth parallel of north latitude, the prohibited season shall be from April 15 to November 15, both days inclusive, of each year.

VIOLATIONS OF REGULATIONS AND SEIZURES OF SKINS.

More active efforts were made in the current calendar year to prevent violations of the regulations and to cause the infliction of adequate penalties when violations occurred. The depletion of the once-plentiful supply of fur-bearing animals has aroused residents of Alaska to a realization of the necessity for proper protection of this natural resource, in consequence of which excellent cooperation is given usually in securing information for prosecutions.

In January, 1918, the Bureau seized at Seattle, Wash., 47 unprime red-fox skins and 3 unprime cross-fox skins from a shipment by O. K. Quean, of Unalaska, Alaska. About the same time the master of the fisheries steamer *Roosevelt* seized from a seaman aboard the vessel 5 unprime fox skins which had been secured at Unalaska on the last voyage of that vessel. These skins were sold at Seattle for the benefit of the Government.

On February 6, 1918, the collector of customs at San Francisco forwarded to the Bureau 4 pup sealskins which were seized at that port in 1914. No claim or application for their return was made by the owner, and instructions were given by the Secretary of the Treasury for the forwarding of the skins to the Department of Commerce. They were subsequently sold for Government account by Funsten Bros. & Co.

On February 18, 1918, Samuel Gowen, special fur warden of the Bureau, seized from Ike Koslosky, manager of the Northwestern Fur Co., at Anchorage, Alaska, 96 beaver skins, 41 unprime mink skins, and 1 unprime land otter skin. Koslosky was fined $100 and costs, amounting to $30, in the United States commissioner's court for having the skins in his possession. The skins were forwarded to Tacoma for sale for the account of the Government.

Warden Shirley A. Baker, stationed at Dillingham, in western Alaska, reported that on March 18, 1918, he seized 1 unprime cross-fox skin from John Matson at Squaw Harbor. On May 15 he seized 6 mink and 16 muskrats from Tom Tennison at Dillingham. He also confiscated 5 bottles of strychnine which were in the possession of Tennison. In addition 16 muskrats and 1 mink were seized from Otto Johannesen of Mulchatna.

Warden C. L. Larson reported that on May 4, 1918, D. O. Banville was convicted in the United States commissioner's court at Franklin of having purchased and shipped a marten skin illegally taken by an Indian. He was fined $20 and paid costs amounting to $2.75.

On June 19, 1918, Game Warden R. E. Steel reported from Eagle, Alaska, that, acting upon information from the deputy United States marshal at Fort Yukon, he had found and taken possession of 21 marten skins which had been mailed at Fort Yukon addressed to a New York firm. The skins were forwarded to the Bureau.

On July 17, 1918, Warden C. F. Townsend reported from Ruby that a United States marshal had turned over to him 10 beaver skins seized from a trader from Seattle. The skins were forwarded to Seattle.

On August 5, 1918, Assistant Agent Christoffers cooperated with customs inspectors at Seattle in the examination of furs transported by the schooner *Ruby*. Seizures were made of the following unprime skins: 3 mink skins consigned by L. K. Goodmanson of Bethel, Alaska, to Louis Levy, San Francisco; 4 mink skins, consigned by Oscar Samuelson, Bethel, Alaska, to Seattle Fur Sales Agency, Seattle; 6 mink, consigned by J. A. Dull, of Bethel, Alaska, to West Coast Grocery Co., Tacoma, Wash.; 21 mink skins consigned from Apokak, Alaska, to the Kuskokwim Fishing & Transportation Co., Seattle; 1 weasel and 7 mink skins consigned by C. F. Carlson, of Bethel, Alaska, to B. B. Green for Horner-Williamson Co., New York City.

Warden C. F. Townsend reported from Russian Mission, on August 20 the seizure from August Melzer, a trader, of 3 beaver, 3 lynx, and 1 mink. The beaver were concealed in the lynx skins, and the latter, although prime, were accordingly confiscated also. The skins were forwarded to Seattle.

On December 11 Special Warden Martin reported the seizure at Seward from J. H. Smith of 1 beaver skin. A search warrant was issued for the examination of Smith's baggage, which resulted in securing this skin. He was charged with its unlawful possession and pleaded guilty in the United States commissioner's court at Seward, being fined $75, with costs in the sum of $22.05. The skin was forwarded to Seattle.

On November 21 Special Warden F. A. Martin at Anchorage seized 10 beaver skins from John Brunner which had been brought in as baggage. Brunner was tried before the United States commissioner at that place and was found guilty of unlawful possession of these skins and was fined $100 and paid costs amounting to $24.30. The skins were forwarded to Seattle.

Assistant Agent Christoffers reported on November 22 the seizure at Seattle of the following furs: From shipment by Capt. Louis Knaflich from Seward, Alaska, to the Kuskokwim Fishing & Transportation Co. at Seattle, 6 unprime weasel skins; from shipment by August Melzer at Nome to himself at Seattle, 5 unprime mink skins.

Assistant Agent Christoffers confiscated from H. Roseboom of Bellingham, Wash., 9 fur-seal skins which had been purchased from natives in the Bristol Bay district in 1917. The Solicitor of the Department ruled that these skins could not be properly authenticated as having been lawfully taken and must be sold at public auction for the account of the Government. After such sale certificates would be issued to show that purchasers were lawfully entitled to their possession.

Warden C. F. Townsend, of Fairbanks, reported that he investigated the rumor as to a case of poisoning at Shageluk in the fall of 1917, but obtained no definite information.

On March 4, 1918, Nicholai Mudock was arrested on complaint of Warden Shirley A. Baker for having killed two sea otters off Sutwik Island, on the Pacific side of the Alaska Peninsula, between April 18 and 25, 1917. The case was tried at Naknek on March 13. Mudock pleaded guilty and was sentenced to three months in jail. A heavier penalty was not imposed on account of the defendant's precarious physical condition. Mudock claimed to have sold one of the skins to William Rutchow, a fur trader at Cold Bay. Careful search failed to locate the skin in Rutchow's possession. Warden Baker complained to the marshal at Kodiak that Rutchow was selling whisky and making seditious remarks. He was subsequently fined $600 and costs for these two offenses. The other skin had also been sold, and it was not located.

SALES OF SEIZED SKINS.

During the calendar year 1918, the following confiscated skins were sold at public auction: 41 mink, 96 beaver, 1 land otter, 51 red fox, 4 cross fox, 2 sea otters, and 13 fur-seal skins. The gross amount received was $2,609.90. Commission and other expenses amounted to $115.02, leaving a balance of $2,494.88 turned into the United States Treasury. A considerable number of confiscated skins were awaiting sale at the end of the year.

FUR FARMING.

Accurate information in regard to fur-farming operations in Alaska is difficult to obtain and is of fragmentary character. In many cases operations are incidental to other work and have been more or less unsuccessful. The data which the Bureau of Fisheries publishes are obtained from correspondence with fur farmers and from reports of employees in Alaska. The Bureau has no direct jurisdiction over fur-farming operations, other than the enforcement of the law and regulations for the protection of fur-bearing animals in Alaska. A number of islands, however, are available for lease by the Department of Commerce for fox propagation purposes.

George L. Morrison, of Hot Springs, reports that considerable loss occurred in his operations in the spring of 1918 because of a disastrous flood, in consequence of which only 33 silver pups were raised from the stock of 29 pairs of silvers and 1 pair of crosses retained in 1917. It was the intention to take the pelts of 25 of the silvers this season. The foxes are kept in 60 corrals, 30 of which are 27 by 27 feet, and 30 are 6 by 27 feet. Mr. Morrison leased his ranch in the fall of 1918 and intended to enter military service.

W. H. Newton, of Healy River, post office Richardson, continued operations with two pairs of foxes. One litter of 6 was raised. He has retained 4 pairs all reared in captivity, and hopes for better success as they are docile and almost domesticated. It was stated that he feeds cooked fish and vegetables. Mr. Newton considers the locality ideal for fur farming, as the food is secured with a minimum of effort and will stay frozen all winter without spoiling. He also contemplates experimenting with marten.

F. Berry, Homer (via Seldovia), is undertaking fox farming in partnership with Dr. E. F. German of Anchorage. They have 1 pair of silver-black foxes and expect to increase the stock and also to secure mink.

Sholin Bros. & Co., of Homer, report satisfactory progress in fur farming. Operations were begun in 1915 with 3 pairs of silver-black foxes; there was no increase in 1916, but in 1917 there were two litters of 5 each which were raised successfully. Sixteen pups were successfully reared in 1918. Three pairs of young foxes have been sold and they retained 12 pairs for breeding purposes. The pens are about 36 by 40 feet, with log houses and dens inside. Cooked fish mixed with corn meal, etc., and rabbits and meat scraps are fed.

James McPherson, of Ellamar, has blue foxes on Peak and Naked Islands in Prince William Sound. The foxes run wild on the islands, the exact number not being known. Fifty-three pelts were taken in 1918. The principal food is fish of various kinds.

J. D. Jefferson, of Valdez, reports excellent success with blue foxes placed on Bald Head Chris Island in 1917. The foxes run at large on the island, but he thinks there are about 15 young. None was killed for fur. The principal food is fish, with rice, oatmeal or corn meal, cooked, with occasionally a little raw fish or game. The foxes thrived and have become extremely tame. Mr. Jefferson reports that they eat ravenously except during the season when the fur is prime. The cross foxes placed on the Dutch Group have not been successful and all but one were lost. Mr. Jefferson intends to place blues on this island and have a keeper to look after them. He states that food is plentiful and easily obtained.

John Tashwak, who has been carrying on fox farming on a small island near Afognak Island, reported that all of his foxes escaped by swimming to the latter island, and that he had none on hand at the end of the year.

Alex. Friedolin continued operations with blue foxes on Hog Island, about 3 miles from Afognak village. He states that many young foxes were lost in the spring and only two young were observed during the summer. The foxes run at large on the island, and on account of crowded conditions in the burrows he has experimented in constructing artificial burrows of logs with dirt on top and covered with roofs; these are dry and warm, but the foxes have not made use of them. In December, 1918, 6 male foxes were killed, and the remaining 3 females and 2 males were liberated for breeding stock. Two additional male foxes were procured and turned loose on the island. Three blue fox pelts sold early in 1919 brought $91 each.

Joseph Filardeau, who maintains a fox farm at the head of Kachemak Bay, reports considerable difficulty and losses of foxes in 1918 through fright as the result of strangers working on the pens, and also because of a shortage of proper food. Mr. Filardeau does not consider foxes any harder to raise than other animals with the right loca-

tion and proper food, but says that if they are kept too secluded and are unaccustomed to seeing strangers and hearing varied sounds they become extremely sensitive and difficult to handle if anything unusual occurs. His stock consists of 5 pairs of foxes and two additional females. Their chief food is sun-cured salmon, with some porcupine and rabbit meat. Because of the scarcity of rabbits, Mr. Filardeau is raising Belgian hares for fox food. He describes his fox pens as follows:

As for the pens—I have built them differently from the usual way owing to the character of the land, a sandy clay which gets very muddy and retains the dampness. The pens are built 24 by 40 feet and 6 feet high, with a 2-inch plank floor, and the sides are planked 2 feet high; from there up is 14-gauge wire netting. These pens are also covered with 16-gauge wire. I keep about 6 inches of gravel and dirt over the floor, also fresh sod, which I think absolutely necessary. As for shade, in summer time I cut grass and throw it over the wire; I also give them green grass inside the pens. The pens are built in two parts, with a wire partition in the center and a sliding door at each end, giving the foxes a chance for a run and exercise.

The dens are built outside the pens, and are of double inch plain lumber, with dirt packed around them. The dens are connected by means of a spout to the pens. There are two dens for each pen.

Peter Petrovsky, of Uyak, continued operations on Amook Island with 3 pairs of silver foxes, 1 cross female and 1 blue male. Only 2 pups were raised in 1918. Mr. Petrovsky does not consider the corral method very satisfactory on account of the prohibition against the killing of birds, which makes it difficult to get a sufficient variety of food.

A. B. Somerville forwarded a photograph of the skins taken from the ranches operated by him in the Aleutian Islands Reservation. These were the first secured since the island was stocked in 1912, and resulted in a take of 224 blue and 15 white pelts, which it is stated sold for $14,000.

S. Applegate, of Berkeley, Calif., maintains blue-fox ranches on Samalga, Ogliuga, and Skagul Islands, within the Aleutian Islands Reservation. In regard to his operations Mr. Applegate writes as follows:

I do not know the number of foxes on either of the islands, as they are allowed to run free, so of course I would not know the number of young born. From the reports of the natives who look after the foxes for me, the litters usually number 5 to 10 young ones; therefore I would judge that they will probably average about 7 young at a birth. As many as 14 have been seen in one litter.

My foxes receive no artificial food, as there seems to be plenty of natural food on the three islands I have chosen. One year I had a fox or two killed each month, just to see in what condition they were. I was told they were found to be quite fat, so I concluded it was unnecessary to import food for them. Their fur in the season of killing has always been found to be long, thick, and glossy, indicating a healthy bodily condition.

I have used corrals and have found that it was a quite impossible, or at least a very uncertain, way to raise them, for they would not breed. I believe the same thing has been experienced elsewhere where it has been attempted.

As to the future prospects, I do not expect any more from my islands than they have yielded in the past. From Samalga Island I will average between 45 and 50 foxes each year. From Ogliuga and Skagul I can not say just what number I can take, as I have had only one season's killing from each.

The islands are all small, Samalga being 4¾ miles long and less than a quarter of a mile wide. Ogliuga and Skagul are only about 300 yards apart, and each is about 2½ miles in length.

As to the number of young foxes successfully raised, from my 18 years' experience on Samalga Island, I should say that about one and a half survives out of each litter; or, in other words, about 80 per cent never attain full growth. This great loss is due to their fighting among themselves and to their being preyed upon by ravens, large gulls, and eagles, particularly eagles. I have been paying the natives for many years

a bounty on each eagle they kill. From 1907 to 1918 they turned over to me the claws of 1,065 eagles. Prior to 1907 I kept no record of the number of eagles killed.

Joseph Voelkl, 18 Mile Post, Haines, reported that the foxes he retained from 1917 had not bred and he had killed all of them. Five of his stock of minks escaped from the pen and he killed the remainder. He states, however, that he expects to build new corrals and obtain new stock.

A. C. Smith, Porcupine, Chilkat Valley, reported that he has 8 pens and a stock of 4 pairs of breeders, 3 silver and 1 cross. Two litters were born in 1918, one of 4 silvers and one of two crosses. He raised 3 of the silvers and 1 cross. The foxes are kept in 8 pens about 20 by 40 feet. The feed given is house scraps, bear meat, horse meat, rabbits, owls, eagles, rice, corn meal, rolled oats, and all kinds of green vegetables.

Rufus D. Blakely, of Ketchikan, has undertaken the raising of muskrats in lakes on Bold Island. It was thought that the efforts to stock the lakes with suitable plants for food were not very successful, because of the condition of the soil, which will require considerable expense for proper treatment. It was stated that the owners contemplate further experiments, possibly with marten and foxes, which require different food.

Inspector E. P. Walker comments as follows on operators in southeastern Alaska:

> John Fanning, who was operating at McHenry Anchorage, Etolin Island, has abandoned his place. The few animals he had in captivity are reported to have escaped, and it is probable that the marten that were on the small island were trapped. Thus there remain but the following four positively known to be operating in the district:
>
> A. C. Smith, at Porcupine, Chilkat Valley, foxes of red stock.
>
> James York, on Sumdum Island, blue foxes.
>
> Green and a partner, successors to Barkdahl & Green, on Sokoi Island, foxes of blue and red stock.
>
> Bert Maycock, on Windfall Island, marten and probably some mink.
>
> F. E. Blitz, an educated, temperate man, who has been the only successful fur raiser in the vicinity of Telegraph Creek, British Columbia (160 miles up the Stikine River), feels that fur farming is a thoroughly practical undertaking if properly located and given the same attention and energies that would be devoted to any other high-class stock raising. He feels that the cause of the numerous failures has been almost wholly due to drink, or, as he expressed it in another way, due to "men who would never make a success of anything."

Warden M. J. O'Connor, after a tour of inspection of fox farms in the Chilkat Valley, expressed the following opinion as to reasons for lack of success:

> I discovered that the fur farms in this district have not been given proper attention for the raising of furs for commercial purposes, principally because the operators do not give their entire time to the business. It appears, after talking with the leading fur farmers in this vicinity, that their breeding pens are not properly situated in that they are built adjoining each other, when they should be entirely apart and at a distance so that the mothers can not hear the young in other pens, nor even see other foxes, since the sight of such makes them very nervous.

SHIPMENT OF FURS FROM ALASKA.

As in previous seasons, shipments of furs from Alaska were reported on special blanks prepared by the Bureau. Supplies of blanks were furnished to all postmasters in Alaska and to commercial companies, express companies, and all persons known to be shippers of furs. Postmasters cooperated by indorsing the reports of mail shipments after having been properly filled out and forwarded them to the Bureau.

The furs shipped from Alaska in 1918 increased greatly in value as a result of the general rise in prices. It is generally conceded that the fur animals of Alaska are decreasing in number, although a larger shipment of all species was reported in 1918 with the exception of lynx and foxes. Reliance must be placed on the cooperation of the shippers in making correct reports. Shipments otherwise than by mail are checked by comparison with the records of the collector of customs at Juneau. For convenience the fur year is reckoned from November 16 of one year to November 15 of the following year.

The following table shows the detailed statistics as compiled from information furnished the Bureau in regard to furs shipped from Alaska in 1916, 1917, and 1918:

FURS SHIPPED FROM ALASKA IN 1916, 1917, AND 1918.

Species.	Year ended Nov. 15, 1916.			Year ended Nov. 15, 1917.			Year ended Nov. 15, 1918.		
	Number of pelts.	Average value.	Total value.	Number of pelts.	Average value.	Total value.	Number of pelts.	Average value.	Total value.
Bear:									
Black	1,129	$9.00	$10,161.00	1,061	$14.00	$14,854.00	1,164	$15.00	$17,460.00
Brown	41	7.50	307.50	62	12.00	744.00	35	12.00	420.00
Glacier	5	50.00	250.00	8	20.00	160.00	35	30.00	1,050.00
Grizzly	14	14.00	196.00	13	17.00	221.00	42	20.00	840.00
Polar	.....	.....	.....	[a] 144	40.00	5,760.00	.....	.....	.....
Beaver	[b] 37	6.50	240.50	[c] 118	10.00	1,180.00	[d] 109	21.00	2,289.00
Ermine	4,345	.80	3,476.00	4,639	.90	4,175.10	9,133	1.50	13,699.50
Fox:									
Black	26	250.00	6,500.00	10	160.00	1,600.00	6	150.00	900.00
Blue	659	50.00	32,950.00	887	58.00	51,446.00	740	85.00	62,900.00
Blue, Pribilof Islands	420	48.20	20,242.00	567	61.11	34,653.50	692	82.51	57,099.50
Cross	2,508	25.00	62,700.00	2,669	35.00	93,415.00	1,704	50.00	85,200.00
Red	15,711	12.00	188,532.00	10,485	24.00	251,640.00	12,232	28.00	342,496.00
Silver gray	318	150.00	47,700.00	443	120.00	53,160.00	440	140.00	61,600.00
White	6,178	20.00	123,560.00	3,682	28.00	103,096.00	4,531	40.00	181,240.00
White, Pribilof Islands	20	14.25	285.00	39	26.33	1,027.00	19	56.84	1,080.00
Hare, Arctic	1,090	.15	163.50	89	.40	35.60	38	.10	3.80
Lynx	21,608	12.00	259,296.00	21,210	14.00	296,940.00	7,692	26.00	199,992.00
Marten	3,100	9.00	27,900.00	[e] 1,210	14.00	16,940.00	[e] 1,023	19.00	19,437.00
Mink	22,255	4.00	89,020.00	18,832	4.00	75,328.00	24,572	6.50	159,718.00
Muskrat	101,827	.35	35,639.45	72,264	.45	32,518.80	86,624	1.20	103,948.80
Otter:									
Land	1,330	15.00	19,950.00	1,308	15.00	19,620.00	1,647	22.00	36,234.00
Sea	[f] 1	500.00	500.00	[g] 2	344.85	689.70	[f] 1	150.00	150.00
Seal, fur, Pribilof Islands	7,061	30.00	211,830.00	9,140	30.00	274,200.00	[h]30,819	30.00	924,570.00
Seal, fur	.....	.....	.....	[i] 5	30.00	150.00	[j] 9	30.00	270.00
Squirrel	214	.10	21.40	117	.05	5.85	153	.02	3.06
Wolf	57	7.00	399.00	195	8.00	1,560.00	207	18.00	3,726.00
Wolverine	297	6.00	1,782.00	435	8.00	3,480.00	846	14.00	11,844.00
Total	.....	.....	1,143,601.35	.....	.....	1,338,599.55	.....	.....	2,288,170.66

[a] The killing of polar bears in Alaska is unlawful.
[b] Shipped under permit.
[c] A considerable number were seized skins. } It is unlawful to kill beavers in Alaska.
[d] Confiscated skins. }
[e] Checked against affidavits permitting shipments. It is unlawful to kill marten in Alaska.
[f] Found dead.
[g] Unlawfully killed by natives.
[h] This is total number of skins shipped; total number seals killed was 34,890.
[i] Taken by natives.
[j] Confiscated skins.

LEASING OF ISLANDS FOR FUR FARMING.

The Department of Commerce is authorized to lease for the propagation of foxes and other fur-bearing animals the Alaskan islands listed below:

ISLANDS WHICH MAY BE LEASED FOR FUR FARMING.

Name of island.	Location.
Chirikof	Southwest of Kodiak Island.
Long	Near Kodiak Island.
Marmot	East of Afognak Island.
Little Koniuji	Shumagin Group.
Simeonof	Do.
Little Naked	One of Naked Islands, Prince William Sound.
Carlson (Crafton)	Prince William Sound.
Middleton	Gulf of Alaska.
Pearl	One of Chugach Islands.
Elizabeth	Do.
Aghiyuk	One of Semidi Islands.
Chowiet	Do.

The lease on Simeonof Island to J. C. Smith, of Sand Point, was canceled for nonpayment of rent.

On December 31, 1918, the following islands were under lease:

Name of island.	Annual rental.	Lessee.
Middleton	$200	Joseph Ibach, Cordova, Alaska.
Little Koniuji	205	Andrew Grosvold, Sand Point, Alaska.
Pearl	200	I. D. Nordyke, Seldovia, Alaska.

Middleton Island, Gulf of Alaska.—This island is under lease to Joseph Ibach, of Cordova. The foxes run wild on the island and the lessee is unable to tell how many there are. In 1918, 100 blue foxes were killed.

Little Koniuji Island, Shumagin Group.—Andrew Grosvold successfully continued fox-farming operations on this island. Detailed information with regard thereto is not available at the present.

Pearl Island, Chugach Group.—This island was leased from July 1, 1917, to I. D. Nordyke of Seldovia. It was not stocked with foxes, as Mr. Nordyke expected to enter military service, but he reports that arrangements will be made to begin operations in the season of 1919.

FUR-SEAL INDUSTRY.

PRIBILOF ISLANDS.

GENERAL ADMINISTRATIVE WORK.

In 1918 the work at the Pribilof Islands was expanded greatly in a number of lines and plans and arrangements were made for new features. With the expiration of the close season of seal killings in August, 1917, commercial killing was undertaken at the opening of the killing season in 1918. Additional labor was brought from the Aleutian Islands and assistants were sent from the States for the season. By means of a special allotment it was possible to erect and equip a by-products plant, which is in readiness for operation in 1919. Considerable building work was undertaken, including new dwellings for natives, salt houses, and a cold-storage building. Routine work was carried on as usual, an important feature of which was the taking of a census of the seal herds on the two islands. Cargo for the islands was again transported by the Bureau's steamer *Roosevelt*.

PERSONNEL.

The statutory employees of the Bureau on the Pribilof Islands in 1918 are listed in the introduction. As a matter of record, the following information in regard to their activities is given, likewise in respect to a number of temporary employees who were at the islands for brief periods:

Agent and Caretaker H. C. Fassett, of St. Paul Island, arrived there May 8, relieving G. Dallas Hanna, who had been in charge of the Bureau's work since in December. Mrs. Myra B. Fassett was employed as a temporary assistant on St. Paul Island. Dr. Harold Heath, of Stanford University, arrived at St. Paul Island on the *Saturn* May 8 to participate in the taking of the seal census. Assistant Agent A. C. Reynolds returned to St. Paul Island in May. Mrs. A. C. Reynolds was employed as nurse on St. George Island. Five men, Zac Botwright, Chas. Schwind, Emil Reinheimer, J. H. Quatmann, and Fred Noack, were sent by Funsten Bros. & Co. to the islands in May to assist in sealing work. R. B. Bentley and J. M. Bush were employed in connection with the by-products plant. They arrived at St. Paul Island August 11, leaving for the States in December. Dr. Charles E. Johnson, who relieved Dr. W. T. Miles, physician, on St. George Island, arrived there in August. Andrew Peterson and Reason C. Gordon, carpenters for St. Paul and St. George Islands, respectively, arrived in August and left in December. Dr. Heath and Dr. Miles left St. Paul August 13 on the *Cedar*. H. D. Aller arrived at St. George Island November 3 to take up the duties of storekeeper. Dr. H. H. Stromberger arrived at St. Paul Island November 5 to succeed Dr. W. B. Hunter, who had resigned. Dr. and Mrs. Hunter left St. Paul in December. Mr. and Mrs. George Haley, school teachers on St. Paul Island, resumed their duties on November 5. G. Dallas Hanna and the five men from Funstens left the islands on September 16 on the *Roosevelt* for Seattle. Assistant Agent Reynolds and Mrs. Reynolds left St. George Island October 22, on a special trip of the cutter *Bear*, arriving at Seattle November 5.

By direction of the Secretary of Commerce, the agents and caretakers on the Pribilof Islands were sent copies of the following letter from the Secretary of the Navy, dated June 27, 1918, expressing the appreciation of the commanding officer of the Alaskan Radio Expedition, 1918, for their cooperation and assistance:

I have the honor to quote the following letter received from the commanding officer, Alaskan Radio Expedition, 1918, for your information:

"Upon the arrival of the Alaskan Radio Expedition and U. S. S. *Saturn* at the Pribilof Islands we were given every assistance that could possibly be expected from the Bureau of Fisheries. The agents in charge, Mr. A. H. Proctor and Mr. H. C. Fassett, merit being brought to the attention of the Department of Commerce for their many acts which were so largely instrumental in promoting the work of the expedition.

"To enumerate the many ways in which they assisted us would be a tedious task. This assistance ranged from placing their transportation and repair facilities at our disposal to furnishing accommodations and subsistence to officers and yard officials in charge of the construction work. Aside from the material assistance they were able to afford, their spirit of coordination was in itself highly appreciated."

Hon. Fred M. Brown, judge of the United States Court, division No. 3, Territory of Alaska, advised in February that he has appointed A. H. Proctor, agent and caretaker, St. George Island, as United States commissioner. This was done upon recommendation of the Bureau, it being thought necessary at the time in order to comply with the marriage-law requirements of the Territory of Alaska.

PURCHASE AND TRANSPORTATION OF SUPPLIES.

As heretofore, arrangements were made to furnish the islands with supplies and equipment essential to the welfare of the natives and regular employees comprising the Bureau's staff. Schedules were printed listing most of the items requisitioned by the agents. Every effort was made to reduce all supplies as much as possible on account of war conditions. Bids were opened at Washington, May 28, for general supplies. It was found there had occurred a considerable advance in price on most of the commodities needed. Supplies were assembled at Seattle, the most convenient shipping point for the Pribilofs. Most of the successful bidders were located at Seattle.

Arrangements were made with Hibbard, Swenson & Co. at Seattle to transport 100 tons of coal from Seattle to the Pribilof Islands on the *Belvedere*, a power trading schooner, which has made several voyages to the Siberian and Arctic coasts. The War Trade Board had considered the advisability of refusing a license for stores and bunker supplies, but the owners offered to transport to the Pribilofs 100 tons of cargo without cost to the Bureau. Upon representations of the advantage accruing to the Bureau, the War Trade Board granted the necessary license. The *Belvedere* left Seattle on April 1 with 100 tons of coal and a few other supplies for the Pribilofs. The vessel finished discharging at the islands on April 30.

The *Roosevelt* left Seattle April 27 with a cargo of approximately 319 tons of general freight and 115,000 feet of lumber for the islands. Passengers were five men in the employ of Funsten Bros. & Co., who were sent to assist in sealing work, and Mr. and Mrs. A. C. Reynolds. Three light motor trucks were included in the cargo.

Arrangements were made with the Bureau of Lighthouses for the transportation on the lighthouse tender *Cedar* of certain heavy items of machinery for the by-products plant, it being regarded that the hoisting gear on the *Roosevelt* would not handle these heavy pieces.

GENERAL VIEW OF VILLAGE, ST. PAUL ISLAND, ALASKA.

The *Cedar* sailed from Seattle June 12 and stopped at Anacortes, where two additional pieces were picked up. The vessel arrived at St. Paul Island August 11.

The *Roosevelt* sailed from Seattle July 26 with 285 tons of general cargo and about 62,000 feet of lumber. The cargo was made up chiefly of materials for the by-products plant. Passengers were two by-products experts, two carpenters, and Dr. Charles E. Johnson, who was to relieve Dr. W. T. Miles as physician on St. George Island.

On account of the large accumulation of freight at Seattle, it was regarded as impossible for the *Roosevelt* to make complete deliveries before winter, hence arrangements were made for the transportation of 200 tons of salt and 100 tons of general supplies on the steamer *Firwood*, sailing from Seattle the middle of August. This cargo was transshipped by the *Roosevelt* from Unalaska in conjunction with the transportation of coal purchased at that place.

The *Roosevelt* sailed from Seattle October 15 on the final trip of the season with 340 tons of general supplies for the Pribilofs. Passengers were H. D. Aller for St. George Island and Dr. and Mrs. Stromberger and Mr. and Mrs. George Haley for St. Paul Island; also two persons identified with the radio station on the latter island.

Through the courtesy of the Coast Guard, 56 barrels, containing 1,978 fur-seal skins, were loaded October 6 at St. George Island on the cutter *Bear*. The vessel landed these skins at Seattle on November 5. This cooperative action by the Coast Guard was of much benefit, as it lessened the work falling to the *Roosevelt* later on when heavy gales at the islands interfered greatly with operations. It was reported that the continuance of heavy weather made it possible to work cargo at St. George Island only three days during the month of November.

BUILDINGS, WATER SUPPLY, AND ROADS.

On St. Paul Island two dwellings were practically completed for occupancy by natives, and a new salt house was carried well toward completion. A new chicken house was constructed chiefly from old materials. Some alterations were made in the Government house to provide greater comfort to the occupants and a start was made toward temporarily repairing the company house, where several employees live. A home-made hot and cold water system was installed in the latter building, which added greatly to the comfort of those residing there.

During the winter of 1917–18 storm windows were placed on the natives' dwellings for the first time. This resulted in considerable saving of fuel as well as adding to the comfort of the people.

The water supply system for St. Paul Island is far from satisfactory, but extensive changes were not possible during the year. It is planned eventually to run a pipe line to Ice House Lake, but work on this project is temporarily held in abeyance. During the winter of 1917–18 the pipe line from the well which had been previously used to carry water to the tanks on the village hill burst at an unknown point. Later a well was dug 16 feet deep in the north end of the village. A flow of water exceeding 20,000 gallons daily was struck, and a pump and pipe line were temporarily installed connecting with the village hill tanks. At first this water was of excellent quality, but after some weeks it became slightly saline, so that its principal

use consisted of affording fire protection and water for laundry and similar purposes. This relieved the natives from carrying a large amount of water during the summer from the wells located about one-half mile from the village, previously their sole source of supply.

A by-products building for the conversion of seal carcasses into oil and fertilizer was built. Machinery was installed and a preliminary trial made in the fall of the year. Details in regard to this project are given under another heading.

With the press of other important duties, not a great deal of time could be devoted to the construction of roads on St. Paul Island. However, many bad places in the existing trails were so improved that it became possible to transport to the salt house the sealskins which were secured on the distant killing fields, with the exception of those taken at Northeast Point. The establishment of a good system of roads on the islands is believed to be one of the most important things to be considered in the future. It is hoped that a definite program can be outlined whereby transportation of the island products may be satisfactorily accomplished. One of the most urgent needs of good roads is to afford the seal rookeries protection in case of raids. These properties are so valuable that it is hoped means will be provided soon whereby armed parties can be transported to any necessary point on very short notice.

On St. George Island building operations constituted the chief work after the seal-killing season was over. Two new dwellings were constructed for the natives and are now occupied. A new salt house was built and will be ready for use in 1919. Temporary repairs were made to many of the buildings, the timbers of which are badly decayed as a result of the 40 years or more some of the structures have been in use.

In the early part of the spring roadways were partially constructed about the village to enable the transportation of seal products and other freight. Time did not permit the building of completed highways, but they were placed in such condition as to prove of great value. The plan being outlined for roads on this island is based upon the needs of sealing operations and the protection required for the rookeries.

Some progress was made in improving the water supply on St. George Island.

STEAMER "ROOSEVELT."

The Bureau's steamer *Roosevelt* was used in 1918 as a supply ship for the Pribilof Islands. Three voyages were made to the islands during the season, the final trip extending well into the winter.

On the first voyage the *Roosevelt* left Seattle April 27 with a full cargo of supplies, arriving at Akutan May 9. Fuel was taken aboard and the vessel proceeded to the Pribilofs. After part of the cargo was discharged diphtheria broke out on board, making it necessary to proceed to quarantine at Unalaska. The physician at St. Paul administered antitoxin before the vessel left. On May 27 the *Roosevelt* arranged to leave for Akutan to take on fuel oil, proceeding thence to Bristol Bay to render aid to several cannery ships in distress on account of the heavy ice. After completing this important work the vessel returned to Akutan and thence to the Pribilof Islands, arriving June 16. The ship had on board 11 Aleut workmen from Unalaska,

which were landed at St. Paul. On the return voyage the vessel left the Pribilofs June 22, the chief items of the cargo being 3,542 fur-seal skins and 711 fox skins. The ship arrived at Seattle July 7.

Certain repairs were then undertaken as a result of some damage received while the vessel was engaged in rescue work in Bristol Bay. It is remarkable that only very slight damage was done to the *Roosevelt* notwithstanding that the vessel broke through 16 feet of ice in places.

In the work in Bristol Bay the *Roosevelt* succeeded after a long search in rescuing 21 persons from a camp on an ice floe where they had taken refuge after the cannery ship *Tacoma* had sunk. The cannery ships *St. Nicholas*, *Centennial*, and *Star of Chili* were brought to safety by the *Roosevelt*. It is said that the *St. Nicholas* would probably have been a total loss inside of 12 hours, with all hands. There were over 300 people on board, including 115 of the *Tacoma's* complement. The *Centennial*, with 161 persons on board, would probably have been a total loss inside of another week. The *Star of Chili*, which had 220 persons aboard, was in no immediate danger. The *Roosevelt* was actively engaged in this work for a period of approximately 16 days, beginning from the time of departure from Unalaska on May 27. Much credit is due Capt. Bierd and the officers and crew for the splendid results achieved. In this connection it seems appropriate to quote from a letter of July 2, 1918, from the Association of Pacific Fisheries, through its secretary, in regard to services performed by the *Roosevelt:*

> We wish to express the appreciation of the association and its members, especially those engaged in Bering Sea operations, to you and through you to the officers and crew of the steamer *Roosevelt*, for the excellent service rendered by that vessel in extricating the large fleet of cannery vessels from the pronounced danger of the ice in the Bristol Bay district. Many of the packers concerned have doubtless expressed themselves on this subject, and it is our pleasure to convey to you the thanks of the association in its entirety.

Letters commendatory of the excellent work done by the *Roosevelt* in respect to the rescue of vessels in Bristol Bay were received from Messrs. H. F. Fortmann of the Alaska Packers Association, and F. Barker of the Columbia River Packers' Association.

On July 26 the *Roosevelt* sailed from Seattle, arriving at the islands in August. After discharging, a trip was made to Unalaska for coal for island use. On September 16 the vessel left the Pribilofs with 17,816 sealskins and about 55 tons of old bones on board, arriving at Seattle October 3. Some delay occurred at Unalaska on account of illness of the first and second officers.

The *Roosevelt* left Seattle October 15 and arrived at the Pribilofs November 3, after having called en route at Akutan and Unalaska. Severe weather was encountered around the islands, which so delayed the discharge of cargo that it became necessary for the vessel to proceed to Akutan the latter part of November for fuel oil. The ship arrived back at the Pribilofs December 2, and left there December 12 with 7,483 sealskins and minor items of cargo aboard. Seattle was reached January 3, 1919.

POWER LIGHTER.

The sundry civil act approved July 1, 1918, contained an item of $20,000 for the purchase or construction of a power lighter for the Pribilof Islands. It had been pointed out to Congress that a vessel approximately 75 feet in length would be very valuable for purposes of communication between St. Paul and St. George Islands and for trips to Unalaska, 250 miles distant, the nearest port of call by regular commercial vessels. It was indicated also that such a tender or lighter would be of much use in assisting with the loading and discharging of freight at the islands, it being necessary for the supply ship to anchor some distance offshore. Still another use for such a vessel would be in guard duty, it being the intention to mount guns on the boat.

In due time plans were drawn by Lee and Brinton, naval architects at Seattle, for a sea-going vessel 70 feet in length, 17 feet in beam, and equipped with an 80-horsepower heavy-duty engine. Fuel tanks were provided for a cruising radius of more than 2,000 miles; the vessel's cargo capacity was to be about 30 tons. Adequate accommodations were to be provided for crew and passengers. Bids were opened at the Seattle office on December 3, 1918, but as the lowest was in the sum of $27,500 nothing could be done because of the inadequacy of the appropriation. After readvertisement bids were again opened at the Seattle office on January 8, 1919, but the lowest was $26,900. It is the purpose to secure, if possible, a supplemental appropriation by Congress in order that this vessel may be built or a suitable substitute purchased.

INSTALLATION OF ELECTRIC LIGHTS.

Through cooperation with Gunner L. B. Dustin of the Naval Radio Station the Bureau was able to install a small electric-lighting plant in the village on St. Paul Island. Almost all of the equipment except the engine was borrowed from the radio station and was subject to return at any time. The miscellaneous supplies which were borrowed have been returned, but the Bureau is still using the generator and switchboard.

The engine and generator were placed on the concrete basement floor of the Government shop and belt was run to the floor above which operated band saw, lathe, and grindstone. Lights were installed in the shop, company house, dispensary, club house, and Government house. Outside wiring consisted chiefly of scraps picked up about the station. Properly insulated wires protected by moldings were placed inside. The distributing switches are protected with fuses and outlets to lines are made in an approved manner. The wiring was done by the electricians of the radio station.

The engine was equipped to burn kerosene and it was found that the quantity used was less than two-thirds that which had formerly been used in the same buildings in kerosene lamps. Owing to the economy thus secured and the superior surroundings which electric lights provide, plans are being made for the lighting of the villages on both islands by this means.

The Bureau is under great obligation to the personnel of the radio station in this matter.

USE OF AUTO TRUCKS.

On the first trip of the *Roosevelt* in 1918 three 1-ton auto trucks were sent to the Pribilof Islands, one to St. George and two to St. Paul. These were Ford machines with Wright truck attachments, and they proved of very great value on both islands.

On St. George Island the truck was used in the early part of the season to construct roads about the village, and later when the sealing operations began, skins were hauled to the salt house and carcasses were hauled to the silo for preservation for winter fox food. After the sealing season was over the truck was of further use in moving building materials and other supplies about the village. Heretofore the only means of conveying freight on St. George was by man power, other than for the short tramroad extending from the landing part way up the village hill.

The St. Paul Island trucks were placed in immediate operation and were used in such work as had been done previously by mules. Sealskins were hauled from several killing grounds to the salt house, freight was distributed from the landings, and some work was done toward the building of roads to the more distant parts of the island. There was some difficulty experienced on this island in getting the machines through loose sand, which occurs especially on the way to Northeast Point. In fact, it was not possible to get within 4 miles of this large killing ground.

The feasibility of using power transportation equipment on the islands was thus fully demonstrated. The Bureau plans to provide additional trucks or tractors as soon as possible.

BY-PRODUCTS PLANT.

During the season of 1918 a by-products plant was erected on St. Paul Island for the reduction of seal carcasses. A special allotment of $25,000 was secured in April from the National Security and Defense Fund for this plant, of which $24,125.07 had been expended at the end of the year for special machinery, supplies, equipment, and miscellaneous expenses. The building is 55 by 75 feet, of two-story frame construction, with concrete foundation. The chief items of equipment are as follows: One 300-ton hydraulic tankage press; 1 rotary vacuum fertilizer drier; 1 vacuum pump 6 by 8 by 12, with condenser; 2 grease tanks; 2 digesters, maximum capacity 4½ tons each; one 4,000-gallon fir tank; two 125-barrel closed-top oil tanks; 2 steel tanks, small; one 35-horsepower boiler; one 12-horsepower horizontal steam engine; one 15-horsepower horizontal gas engine; one 6-horsepower horizontal gas engine. The machinery has been so placed that 2 more digesters can be added without rearrangement.

The building was put up and machinery installed under the supervision of R. B. Bentley, a by-products expert engaged for the season. Although the plant was completed too late for much practical use before the seal migration was over, two experimental tests were made which gave interesting results. In the first test 71 carcasses were placed in the digester, some of which weighed as much as 180 pounds, and in the second test 73 carcasses were used, ranging in weight from 41 to 131 pounds. It was found that from 3 to 3½ hours was the

length of time necessary to cook the carcasses, depending on size, in order to soften the bones sufficiently for proper handling in the press. This was with a load of 6,000 pounds of raw material in the digester. Pressure of between 2,200 and 2,500 pounds is required to remove the oil from the material after it comes from the digester. In drying, a steam pressure of 45 pounds was carried on the drier, the time required being 2½ hours. It is reported that the meal is of very good quality and will not need grinding, as the largest piece of bone is not larger than a match head.

In these two tests with 144 carcasses, or 12,644 pounds of raw product, 2,738 pounds of seal meal and 70 gallons of oil were secured, an average of 19 pounds of meal and one-half gallon of oil per carcass. This, however, is not considered to be a fair test of the quantity of oil obtainable because quite an amount of oil in spaces in the machinery was not recovered, and moreover the seals were taken in the latter part of October just before the end of the migration, when they are poor and thin, with almost no blubber remaining on them. During the regular killing season prior to August 10 much more blubber will remain on the carcasses, and it is estimated that an average of 2 gallons of oil will be obtained from each carcass.

Arrangements are being made for tractors and trailers for use in the season of 1919 for transportation of carcasses principally from Northeast Point, where large killings are made.

COLLECTIONS OF OLD SEAL AND SEA-LION BONES.

Three shipments of old seal and sea-lion bones from the Pribilof Islands were made in 1918, which were delivered at Seattle as follows: July 7, gross weight 86,010 pounds; October 3, gross weight 108,726 pounds, and January 3, gross weight, 30,631 pounds. These bones were delivered to Brady & Co., of Seattle, under contract to purchase at $29 per ton. The total net weight of the three shipments was 205,611 pounds, and the net proceeds after deducting expenses for weighing, resacking, etc., were $2,785.66, of which the natives earned $1,119.80 for collecting the bones. The balance was turned into the Treasury of the United States.

On account of the great expansion of activity in other lines of work on the islands, it has not been possible to devote much attention to the collecting of seal bones. It is planned that the bones now awaiting shipment will be sold on local proposals at Seattle or San Francisco, as means for their transportation become available.

NATIVES OF THE PRIBILOF ISLANDS.

HEALTH CONDITIONS.

In the main the health of the people on the Pribilof Islands, Alaska, during the calendar year 1918, has been good. Births have exceeded deaths, as shown by the census report, and no dangerous epidemic of infectious disease manifested itself. Through the greatest of good fortune Spanish influenza did not reach these isolated islands. Grave consequences were foreseen in case it should have broken out. Diphtheria occurred on board the Bureau's supply vessel *Roosevelt*, but fortunately before there had been any exposures of consequence, the use of antitoxin by the St. Paul physician was effective in preventing the introduction of this disease. The vessel was quarantined in Unalaska until it was safe to return to the islands.

BY-PRODUCTS PLANT, ST. PAUL ISLAND, 1918.

NEW TYPE OF NATIVE COTTAGE, PRIBILOF ISLANDS, 1918.

The labor connected with the taking of upward of 30,000 sealskins in the short period of about two months was very fatiguing to the natives, because it had been so long since they had been employed to such an extent before. Not since 1889 had as many been taken, which was of course before most workmen of the present generation were old enough to go on the killing fields. It is believed that in subsequent seasons this difficulty will not be encountered to such an appreciable extent.

Several major operations were successfully performed by the island physicians, most notable among which was that by Dr. W. Byrd Hunter on account of the unfortunate fall from a cliff on St. Paul Island of Dr. Harold Heath, of Stanford University, temporarily in the Bureau's service as naturalist. The trail over which he was walking near Tolstoi rookery caved away, and he fell upon jagged rocks about 45 feet below. Fractures of both legs and of a number of face bones resulted. Through prompt and efficient medical and hospital attention his life was saved, but he was incapacitated for many months.

The Bureau sent to St. Paul Island some lantern slides which were received from the Public Health Service. These were shown in connection with motion-picture exhibitions and were productive of considerable interest among both natives and employees.

As with the schools, progress toward an ideal situation in medical and sanitary matters is necessarily slow. Notable progress, however, is made each season, and when it is considered that 60 years ago the population was living in underground hovels, the results in the aggregate are highly satisfactory. Each year marks a step forward in the betterment of the natives from both medical and moral standpoints. One of the greatest results obtained has seemed to be the elimination of church practices which were conducive to the spread of tuberculosis and other communicable diseases. The natives in general are amenable to discipline and after a little cheerful persuasion are willing to abandon inherited and acquired customs which are believed to be injurious. Physicians have compared the island communities most favorably with such places as coal-mining camps. Some of the Bureau's officials who have had occasion to visit many parts of Alaska in the course of their duties have stated that the conditions on the Pribilofs are much better than among the other native communities.

In the fall of 1918 A. C. Reynolds, then assistant agent on St. Paul Island, was taken ill with what was diagnosed brain tumor. His condition became so serious that the physician asked for his immediate removal to the States. Through the cooperation of the Coast Guard the cutter *Bear* called at St. Paul Island and took Mr. Reynolds and his wife to Seattle. On November 9, a few days after arrival, he passed away. His loss is seriously felt by all concerned.

SCHOOLS.

It is believed that the earnest efforts of the school-teachers on St. Paul and St. George Islands have been rewarded with encouraging progress. In any one year it would be impossible to effect a revolution in the entire social life of the natives, yet this would be necessary to produce the condition which is most desired. The making over of

people living in an aboriginal manner and without knowledge of American institutions into useful citizens of the country must necessarily be a slow process. Many persons whose acquaintance with them lasts but the brief period of one or two years are apt to become discouraged and give up hope of any material change for the better. When it is remembered, however, that all progress which has been made to the present time has occurred in comparatively few years, it must be admitted that the work of the teachers has been splendid.

There are many handicaps in their way, yet it appears that these are being overcome in the best possible manner. It is the purpose to create a community of English-speaking people with all the knowledge which is required of the best American citizen. The greatest obstacle to this is the fact that the people speak the Aleut language in their homes. Some of the older ones, who had little or no opportunity to attend the schools, have little knowledge of the English language. The children are in English-speaking surroundings (school room) a very short time, yet many of them are able to speak and write on any of the subjects which come within their purview; so it becomes clear that the English language can be established in the short period of about one generation in a locality where another language is used exclusively.

Another thing which hinders progress of the children in school is the lack of textbooks which would be most suited to their purposes, but this can not be overcome, because books which would be best adapted to the north are not in existence. The people of the Pribilof Islands have never seen most of the articles upon which the text of elementary class books is based. Hence a great deal of improvisation must be resorted to by the teacher.

C. E. Crompton, school-teacher on St. George Island during the winter of 1917–18, has analyzed the problem very carefully. The following quotations from his report will throw further light thereon:

> The children were obedient, as polite and well mannered as they knew, and the schoolroom in general always presented a neat and well-ordered appearance. Uncleanliness was exceptional, and no criticism was made except in the case of two families, who were already noted for being the most backward in the community.
>
> The greater number of the children take school and its work quite seriously, and although this tendency was not deterred, an effort was made to encourage them in play. This they do not know how to do, and when opportunity was offered they were shown simple little games, how to make toys of paper and wood, and various other ways of amusing themselves. This, of course, was outside of school hours.
>
> The pupils are tractable, good natured, supersensitive, and responsive to good treatment, and it is felt that they try to do right most of the time. This is true of the normal adult Aleut as well.
>
> The methods of instruction in general were the same as those in force during the preceding term, and they were found quite satisfactory. It is believed that the system of teaching which is now in vogue in the island schools is admirably suited to the needs and capabilities of the children, and will produce excellent results if continued through a period of years. Written work was required in all classes; such work had to be reasonably neat and no copying was permitted. The papers were in most cases made out with pencil, corrected by the teacher or by the pupils in class, and returned to the owners that they might know their mistakes.
>
> No strict rules are adhered to in the advancement of the pupils. They go forward as individuals whenever their work warrants the step; never before. With this plan in operation, no bright pupil is held back because of dull ones in his class.
>
> One of the greatest drawbacks to the school work was the haste with which classes had to be handled in order to hear them all within the school day. This condition must invariably result when children of all ages resort to the same schoolroom.

At all times it was the aim to keep alive interest in the school, its work, and the advantages to be gained from earnest application to what it had to offer. With this in mind, steady routine work was avoided as much as was consistent with the desired rate of progress. Singing, spelling matches, addition and multiplication drills and talks by the teacher on subjects which could be understood, did much toward this end. This occasional stimulation of interest is believed to be very important inasmuch as it seems a trait of the Aleut to demand periodical excitement and variation as the price of his undivided attention.

As has often been said, the seeming apathy with which the Aleut people regard the study of our language constitutes the greatest difficulty in the accomplishment of other work in the schools. This is indeed true, and while the belief is entertained that considerable progress has been made during the past term, the day when it will cease to be the prime factor in the school work is not yet in sight.

As in several previous terms the exclusive use of English in the schoolroom was insisted upon. It was voluntarily used to a certain degree in the outdoor play about the school building. In order to encourage expression the pupils were not prohibited from conversing freely in an undertone as long as this did not disturb the hearing of classes and general order of the room. It was felt that this laxity of strict class-room discipline was in good cause as the free exchange of thought, in English, is one of the most desirable ends we have in view for the present.

The story books received last November from the Bureau through its librarian were placed in a neat bookcase and given a permanent place in the schoolroom. The children were allowed to take these in systematic order one at a time, and they proved of very great assistance in the work. Many of the adults availed themselves of this opportunity to obtain reading matter and some became regular applicants. It is hoped that more books of a similar character to these may be furnished from time to time to the end that this little library may eventually become a dependable source of entertainment for the children. The books already sent were exceptionally appropriate for the existing needs. The value of children's periodicals such as the Youth's Companion, the American Boy, St. Nicholas, and others, is inestimable in this connection.

As in other subjects, the difficulty incident to the study of arithmetic texts was entirely due to an incomplete understanding on the part of the pupils of the English statements contained in them. It is felt that of all studies arithmetic is the most difficult to present in an orderly manner to the Aleuts. However, regular classes were held, embracing subjects from simple addition to computing area and volume.

Daily practice in writing was continued throughout the term and steady improvement was noticeable in many cases. Toward the close of the term all were asked to write a letter to some one whom they knew on St. Paul Island. This idea was taken up with apparent pleasure, and the correspondence was mailed in the regular manner. Many of them wrote very intelligible letters about school, community, and family affairs, and it is planned to encourage further letter writing between people of the islands in order that they may more often be called upon to express their thoughts in our language.

Spelling is the one subject in which the Aleuts do not meet with the usual difficulties. They can commit the words by simple observation of their structure without making any effort to understand their meaning. In this last connection, however, they were given the definition of each word as they wrote it out, and a test late in the term showed that they had grasped the meaning of a great number of words.

The institution of a course in manual training, it is believed, would prove very beneficial. With the number of pupils at present under one teacher, however, it would be an impracticable step. Other important studies would have to be abandoned.

Instruction in cobbling was given to the older boys, and the resulting work was entirely worthy of the effort made. It is felt that this is a good measure of thrift, and that similar instruction should be continued during each school year, even at the sacrifice of some textbook studies.

It is appropriate here to comment on the work of the junior school which was conducted by Mrs. Proctor. The value of this little preparatory course is inestimable. The pupils coming from there to the senior school have already obtained a knowledge of conversational English, of what the school is and its purpose, and also an understanding of schoolroom decorum, which is sometimes hard to impress upon very young children. If the senior school-teacher were to devote the time and attention necessary to starting in of the newcomers, it would very seriously handicap the work of the older children.

The number of pupils enrolled in the school was 15 boys and 18 girls, a total of 33. The average daily attendance was 27.25 and the percentage of punctuality 99.56.

On St. Paul Island the regular plan of procedure has been followed by the teachers. In addition to the usual work, the girls have had either sewing or knitting lessons once each week. In sewing it was aimed to teach the most common stitches and to sew on buttons and make button holes. Mittens and socks were made in the knitting classes.

In order to promote their knowledge of English, the children were required in a great many cases to write out the weekly requests for supplies from the store for their families. The adding up of all these proved to be valuable training in arithmetic.

It is reported that the books which were sent to the school library were much appreciated by both teachers and pupils. These volumes have greatly increased the interest in the school work and have led to some reading in the homes by both children and parents.

ATTENDANCE AT SALEM INDIAN TRAINING SCHOOL, CHEMAWA, OREG.

Encouragement has been given to the natives of the Pribilof Islands to attend the Salem Indian Training School at Chemawa, Oreg. It is believed that in addition to the educational advantages thus available, the opportunity to come in contact with the outside world tends to broaden their views and to be beneficial in many ways. Several have thus embraced this opportunity to receive an education. From March 31, 1917, the date of the last census, to the end of 1918, two had completed the course and returned to the islands. These were John Hanson of St. Paul Island, and Constantine Lestenkof of St. George Island, both young men who are now among the most useful to the Bureau and the communities. Some Pribilof natives, after completing the course of study, have chosen to remain in the States.

During the above-mentioned period one native other than those named returned to the islands and five departed for the school. One returned to the islands for a visit at the close of his first term of three years, but again enrolled for a second term. The authorities at the school have spoken in the highest terms regarding the intelligence and behavior of the Pribilof natives.

Unfortunately two boys died at the school in 1918. Terrenty Merculieff, age 14, died June 18, of pneumonia. His mother, Agafia Merculieff, three brothers and one sister reside at St. Paul Island. He entered school during the summer of 1917. His estate consisting of $36.44 on December 31, 1918, in the custody of the Commissioner of Fisheries as trustee, will be disposed of properly in due time.

Alexey Emanoff, age 18, died October 14 of pulmonary tuberculosis. He is survived by a stepmother and four stepbrothers on St. Paul Island, but he had been cared for by Ekaterina Krukoff, to whom his estate of $270.41, in the custody of the Commissioner of Fisheries as trustee, will pass. He entered school at Chemawa in the fall of 1915, but was kept at a sanitarium at Lapwai, Idaho, the greater part of the time.

The following table gives the status of Pribilof natives at Chemawa, as of December 31, 1918:

NATIVE SCHOOL CHILDREN, ST. GEORGE ISLAND, ALASKA.

PRIBILOF ISLANDS NATIVES IN ATTENDANCE AT SALEM INDIAN TRAINING SCHOOL, DEC. 31, 1918.

Name.	Island residence.	Year of enrollment.
Emanoff, Ioniky	St. Paul	1916
Fratis, Agrifina	do	1915
Fratis, Akalina [a]	do	1915
Fratis, Martha	do	1915
Fratis, Ouliana	do	1915
Kochergin, Peter T	do	1916
Lekanof, George	St. George	1914
Melovidov, Alfey	St. Paul	1917
Shabalin, Daniel	do	1917
Stepetin, Nicolai	do	1917
Stepetin, Vasilii	do	1917

[a] Mother of Agrifina, Martha, and Ouliana Fratis, but not actually in attendance at the school.

MOTION PICTURES.

In the fall of 1916 the personnel of the Naval Radio Station on St. Paul Island purchased a motion-picture projector. The Bureau secured 100,000 feet of films, chiefly of an educational and news-pictorial character, although a few reels were comedies and dramas. Through informal arrangements the employees of the radio station furnished the current and operated the machine. This was installed in the building known as the native shop, and exhibitions were given at regular intervals throughout the fall and winter. It is the expressed opinion of every one concerned that this was probably the best investment which had ever been made from an educational standpoint for the natives.

Under similar arrangement films were secured in the fall of 1917 and exhibitions were given through the following winter months with the same gratifying results. In the spring of 1918, the natives of St. Paul Island subscribed funds for the purchase of the machine from the radio station employees. Films were provided by the Bureau the following fall in the same manner as before.

The natives of St. George Island organized in the spring of 1918 and subscribed funds for the purchase of a motion-picture projector. This was sent from Seattle in the summer and put in operation in the fall with films supplied in the same manner as for St. Paul Island.

SAVINGS ACCOUNTS.

As in previous years, a number of the natives of the Pribilof Islands have personal funds which are in the custody of the United States Commissioner of Fisheries as trustee. These funds are still on deposit with the Washington Loan & Trust Co., Washington, D. C., and draw interest of 3 per cent per annum, calculated on monthly balances. During the year 1918 one native, Elisaveta Rukovishnikoff, withdrew all funds which were to her credit and the account has therefore been closed.

On January 1, 1918, the balance was $4,454.98. Interest credited July 1, 1918, amounted to $60.12, and on December 31, 1918, $50.70, making a total of $110.82 for the entire year. No funds were deposited during the year, and withdrawals amounted to $1,391.15, leaving a balance on December 31, 1918, of $3,174.65, in accordance with the itemized statement which follows.

PRIBILOF ISLANDS NATIVES' SAVINGS ACCOUNTS IN THE CUSTODY OF THE UNITED STATES COMMISSIONER OF FISHERIES, AS TRUSTEE, DEC. 31, 1918.

Funds of—	Amount.	Funds of—	Amount.
St. Paul Island:		St. Paul Island—Continued.	
Bourdukofsky, Apollon	$95.07	Merculieff, Paul A	$14.27
Bourdukofsky, Peter	57.19	Merculieff, Terenty [a]	36.44
Diakanof, Auxenia (Mrs. C. H. Hope)	24.25	Oustigoff, Peter	23.03
Emanoff, Alexey [a]	278.51	Pankoff, Agrippina	222.05
Fratis, Agrifina [b]	87.53	Pankoff, Maria M	40.64
Fratis, Akalina [b]	516.03	Sedick, Marina	.38
Fratis, Martha [b]	87.53	Tetoff, Vikenty M	40.63
Fratis, Ouliana [b]	87.53	St. George Island:	
Gromoff, Iuliania	401.21	Galanin, Mary	272.22
Hanson, John	18.20	Lestenkof, Michael	111.27
Kozloff, Parascovia	82.91	Merculiof, Agrifina	116.58
Krukoff, Iuleta	42.63	Merculiof, Joseph	22.88
Mandregan, Alexandra M	9.64	Merculiof, Polyxenia	11.57
Melovidov, Alfey	40.64	Philomonof, Mary [a]	111.76
Melovidov, Anton	3.50	Philomonof, Zoya [c]	110.57
Melovidov, Iosef	40.64	Shane, Michael	27.95
Merculieff, Dosofey	36.44	Zacharof, Emanuel	30.08
Merculieff, Makary	36.44		
Merculieff, Mariamna	36.44	Total	3,174.65

[a] Deceased, estate undivided.
[b] Not living on islands in 1918.
[c] Married to Michael Borenien in July, 1918. Left St. Paul Island in December, 1918.

LIBERTY BONDS.

The natives of the Pribilof Islands subscribed to Liberty bonds of the third issue in the amount of $2,350. Of this sum, St. George Island natives purchased $1,200 worth with money earned by taking fox skins, and $300 worth from funds on deposit with the Washington Loan & Trust Co. St. Paul Island natives purchased $850 worth from funds on deposit at the same bank. These bonds, 47 in all, were of $50 denomination. Since purchase, three have been disposed of by the natives at par value, and the remaining 44 are being held in a safe-deposit box at the Washington Loan & Trust Co.

The natives of St. George Island subscribed to Liberty bonds of the fourth issue in the amount of $2,150; the bonds numbering 43 in all are of $50 denomination. Of this amount, $150 contributed by the natives of St. George Island was invested in three bonds as the beginning of a fund to be used for the building of a new parsonage. These three bonds are being held in the name of the "St. George Island Church Building Fund." They are also in a safe-deposit box at the Washington Loan & Trust Co. These 43 bonds were purchased with funds earned by the St. George natives for the taking of sealskins.

The St. Paul Island natives subscribed to Liberty bonds of the fourth issue in the amount of $4,700. These bonds, 94 in number, are of $50 denomination. They were purchased direct from the Treasury Department by the Commissioner of Fisheries with funds earned by the natives for the taking of sealskins and were forwarded to the island April 10, 1919. There were also purchased from the Treasury Department nine $50 bonds of this issue for the Chinese cook on St. Paul Island. These bonds were forwarded to Assistant Agent Christoffers at the Seattle office, to be held by him pending instructions from the owner regarding their disposition.

On April 10, 1919, there were forwarded to the natives of St. George Island all interest coupons due through April 15, 1919, on the bonds of the fourth issue and also all interest coupons due through March 15, 1919, on the bonds of the third issue. There were sent to the St. Paul Island natives coupons due on the bonds of the third issue through March 15, 1919. The total of all coupons forwarded amounted to $122.63.

DIVISION OF SEALING FUND IN 1918.

Pursuant to the terms of the contract with the Department of Commerce, Messrs. Funsten Bros. & Co., of St. Louis, advanced funds for the reimbursement of natives at the Pribilof Islands for taking fur-seal skins. In 1918 the sums of $17,376.35 and $3,600 were deposited with the Dexter Horton National Bank at Seattle to the credit of H. C. Fassett and A. H. Proctor, respectively.

St. Paul Island.—The natives were classified according to their value and ability. On St. Paul Island the sealers were divided into four classes, as follows:

DIVISION OF SEALING FUND, ST. PAUL ISLAND, 1918.

	Number of men.	Share of each.
First class	21	$391.50
Second class	9	293.50
Third class	9	195.50
Fourth class	5	98.00
Total	44	

In addition there were 10 others, 8 boys and 2 laundresses, who received small amounts on St. Paul Island. The total take of skins was 26,881, but a deduction of 377 was made for faulty workmanship, leaving 26,504 skins at 50 cents per skin, or a total of $13,252, which was disbursed on 54 vouchers for the services of an equal number of St. Paul natives in obtaining and preparing for shipment the sealskins taken from the beginning of the calendar year through August 10, 1918.

In addition, pay rolls for the services of 11 Unalaska natives from June 1 through November 19, 1918, in the sum of $4,024.35 were paid. Also the sum of $100 was disbursed as a special emolument to two native foremen.

The following is a statement of these disbursements for St. Paul Island:

Payments to 54 natives	$13,252.00
Payments to 2 foremen	100.00
Payments to 11 Unalaska laborers	4,024.35
Total	17,376.35

The above payments aggregate the total sum deposited to Mr. Fassett's credit.

St. George Island.—The take of sealskins on St. George Island in the calendar year 1918 through August 10 was 7,000. In arriving at the method of dividing the earnings of the natives, Mr. Proctor rated the sealers as follows:

Division of Sealing Fund, St. George Island, 1918.

	Number of men.	Share of each.
First class	13	$147.50
Second class	7	118.00
Third class	3	95.50
Fourth class	3	81.00
Fifth class	.3	66.00
Total	29	

No deductions were made for faulty skinning, but four men were demoted to a lower class because of improper work. Two foremen were paid a total of $100 and three boys were allowed $10 each. The payments made to 32 St. George natives aggregated $3,600, the total sum placed to Mr. Proctor's credit.

CENSUS.

It is the policy of the Bureau to take an annual census of the native inhabitants of the Pribilof Islands and publish the full records from time to time. The census in 1918, a recapitulation of which is given below, was taken as of March 31.

Recapitulation of Census of Natives.

St. Paul Island:		
Resident population Mar. 31, 1917		193
Births during year ending Mar. 31, 1918		12
		205
Arrivals during year (from St. George Island)		3
Arrivals during year (from Unalaska)		1
		209
Deaths during year		3
		206
Departures during year (to St. George Island)		2
		204
Departures during year (to Chemawa, Oreg.)		5
Total native resident population Mar. 31, 1918		199
Natives at Salem Indian Training School at Chemawa, Oreg		12
Total natives accredited		211
St. George Island:		
Resident population Mar. 31, 1917		123
Births during year ending Mar. 31, 1918		6
		129
Arrivals during year (from St. Paul Island)		2
		131
Arrivals during year (from Chemawa, Oreg.)		1
		132

St. George Island—Continued.		
Deaths during year		6
		126
Departures during year (to St. Paul Island)		3
Total native resident population Mar. 31, 1918		123
Native at Salem Indian Training School at Chemawa, Oreg		1
Total natives accredited		124

It will be noted that the total native population on both islands on March 31, 1918, was 322 and the total accredited to the islands was 335.

FUR-SEAL HERD.

QUOTAS FOR KILLING.

The killing of seals for commercial purposes could have begun legally on August 25, 1917, upon the expiration of the closed season, but it is not practicable to take skins at that time of year. Later, after October 20, when the stagy period is over, a large number could not be secured because the annual southward migration was then well advanced. Therefore commercial operations opened in reality in 1918.

The establishment of the number and age of animals to be killed is placed by law in the hands of the Secretary of Commerce. Thus on April 11, 1918, the following telegraphic instructions were issued to the island agents:

> Secretary directs killing present year twenty-five thousand male seals three years old and upwards. Twenty thousand St. Paul and five thousand St. George. Make every practicable effort complete commercial killing by August tenth. Kill as many large seals as practicable, keeping in mind number which census report shows should be reserved each age class. Law requires reservation five thousand selected three-year-olds, which reservation should be made in ratio five St. Paul and one St. George. If conditions warrant, Department will instruct kill ten thousand additional seals. Therefore, keep Bureau fully informed regarding conditions bearing on availability seals and ability islands take increased number skins.

Upon the receipt subsequently of favorable reports from the islands, on July 18 the quota was definitely fixed at 28,000 for St. Paul Island and 7,000 for St. George Island. The St. George quota was secured by August 10, and on October 14, it was increased to 7,700 in order to provide food for the natives. It is not expected that the ratio of one on St. George to four on St. Paul can be maintained indefinitely because the history of the herd and census reports show that this is not the actual proportion of the animals resorting to each island.

KILLINGS OF SEALS.

St. Paul Island.—During the calendar year 1918, there were killed on St. Paul Island 27,503 seals. These were handled in 76 separate drives beginning on January 14 and ending on December 12.

St. George Island.—During the corresponding period 7,387 seals were killed on St. George Island. These were handled in 43 drives, beginning on June 3 and ending on November 19.

Thus there were killed on the Pribilof Islands a total of 34,890 seals, the largest number secured in any one year since 1889. The details of the killings are shown in the following tables:

RECORD OF SEAL KILLINGS ON ST. PAUL ISLAND IN 1918.

Date.	Serial number.	Hauling ground.	Skins secured.
Jan. 14	1	Sivutch (Sea Lion Rock)	27
Mar. 7	2	do	139
May 6	3	do	164
25	4	Northeast Point	358
June 1	5	Tolstoi	91
4	6	Zapadni	320
6	7	Northeast Point	163
7	8	do	533
8	9	Polovina	243
10	10	Reef	670
12	11	do	289
14	12	Zapadni	545
15	13	Tolstoi	424
15	14	Northeast Point	139
21	15	Reef	267
22	16	do	1,039
24	17	Northeast Point	1,062
25	18	Polovina	513
26	19	Zapadni	796
27	20	Gorbatch	331
28	21	Tolstoi	465
29	22	Reef	1,276
July 1	23	Northeast Point	1,037
2	24	Polovina	350
3	25	Zapadni	292
4	26	Gorbatch	349
5	27	Tolstoi	285
6	28	Reef	974
8	29	Zapadni	781
9	30	Tolstoi, Lukanin, and Kitovi	362
10	31	Reef	545
11	32	Gorbatch	746
13	33	Northeast Point	1,052
15	34	Zapadni	648
16	35	Reef	653
17	36	Tolstoi	351
17	37	Lukanin and Kitovi	83
18	38	Polovina	255
18	39	Tolstoi	157
19	40	Zapadni	566
20	41	Reef	409
23	42	do	482
24	43	Tolstoi	204
24	44	Lukanin and Kitovi	138
25	45	Northeast Point	1,047
26	46	Polovina	253
27	47	Reef	706
29	48	Zapadni	371
30	49	Tolstoi	222
30	50	Lukanin and Kitovi	151
31	51	Reef	566
Aug. 1	52	Zapadni	368
2	53	Polovina	183
3	54	Northeast Point	1,112
5	55	Tolstoi	213
5	56	Lukanin and Kitovi	100
6	57	Reef	644
8	58	Little Zapadni	94
8	59	Zapadni	198
10	60	Reef	80
26	61	Gorbatch	20
Sept. 14	62	do	21
Oct. 1	63	do	18
12	64	Reef	17
16	65	do	24
23	66	Tolstoi	123
28	67	Reef	74
30	68	do	36
30	69	Tolstoi	11
Nov. 2	70	Reef	13
5	71	do	24
9	72	Northeast Point	63
11	73	Reef	41
23	74	do	73
29	75	do	57
Dec. 5	76	Northeast Point	7
		Total	27,503

RECORD OF SEAL KILLINGS ON ST. GEORGE ISLAND IN 1918.

Date.	Serial number.	Hauling ground.	Skins secured.
June 3	1	North	43
5	2	East	163
9	3	Staraya Artil	91
10	4	North	62
11	5	East	77
14	6	Zapadni	36
15	7	Staraya Artil	95
15	8	North	183
17	9	East	244
19	10	Zapadni	50
20	11	Staraya Artil	131
21	12	North	125
23	13	East	346
25	14	Staraya Artil	192
26	15	North	268
27	16	East	300
30	17	Staraya Artil	178
July 1	18	North	191
3	19	East	611
5	20	Staraya Artil	100
5	21	North	220
8	22	East	416
9	23	Staraya Artil	161
10	24	North	348
18	25	do	207
20	26	East	287
22	27	Staraya Artil	212
23	28	East	174
25	29	Zapadni	151
26	30	Staraya Artil	144
26	31	North	158
29	32	East	385
31	33	North	206
31	34	Staraya Artil	156
Aug. 5	35	East	206
9	36	North	83
Oct. 21	37	do	48
25	38	East	66
Nov. 1	39	North	72
2	40	Zapadni	16
5	41	East	74
14	42	North	49
19	43	Staraya Artil	62
		Total	7,387

FUR SEALS ON SHORE AND IN SURF.

BRANDED SEALS AND AGE STANDARDS.

In 1912, through the initiative of George A. Clark, 5,228 fur-seal pups were branded with an inverted T on the top of the head. Of these, 1,944 were males, 1,796 were females, and the sex was not recorded for 1,488. It may be supposed that half, or 744, of the latter were males, because the births of the sexes are generally believed to be equal. This would make the total number of males branded in that year 2,688. These animals have been reappearing upon the hauling grounds every year and much valuable information has been secured from them on the growth of fur seals. Some have been killed each year and the records secured have been published in this and corresponding reports for previous years. On the islands it has been the practice to record the length of the body, the gross weight after sticking, and the weight of the skin before salting. Each skin has been tagged, and after arrival at St. Louis the trade classification has been ascertained by experts in this work.

In 1918 these seals were 6 years old. On St. Paul 23 were killed and on St. George 14, a total of 37. All were secured before the close of the sealing season on August 10, none being taken during the fall season. The records of these 37 branded seals are shown in the following table:

RECORDS OF BRANDED 6-YEAR-OLD MALE FUR SEALS KILLED ON THE PRIBILOF ISLANDS DURING THE CALENDAR YEAR 1918.

Serial No. of skins.	Date of killing.	Island.	Carcass weight.[a]	Carcass length.	Green-skin weight.		Trade classification.[b]
			Pounds.	*Inches.*	*Pounds.*	*Ounces.*	
AP 6456	Mar. 7, 1918	St. Paul	115	54.75	16	4	Extra extra large.
AP 6457	May 6, 1918	do	175	63.00	20	12	Wig.
AP 6458	June 1, 1918	do	172	61.75	20	6	Extra extra large.
AP 6459	June 10, 1918	do	155	58.50	16		Do.
AP 6460	do	do	158	61.50	18	8	Do.
AP 6461	do	do	144	57.00	16		Do.
AP 6462	June 12, 1918	do	170.50	60.25	17		Do.
AP 6463	June 21, 1918	do	254	66.50	35		Wig.
AP 6464	do	do	157	58.00	20		Extra extra large.
AP 6465	do	do	149	59.75	22		Do.
AP 6466	do	do	141	57.00	20		Do.
AP 6467	June 22, 1918	do	170	63.25	23		Wig.
AP 6468	do	do	198	64.00	28		Do.
AP 6469	do	do	175	62.00	21		Do.
AP 6470	do	do	197	63.50	27		Do.
AP 6471	June 27, 1918	do	185	61.00	21		.....
AP 6474	June 29, 1918	do	174	63.50	24	8	Wig.
AP 6475	do	do	154	58.00	21	8	Extra extra large.
AP 6476	do	do	112	56.25	15		Do.
AP 6477	do	do	166	60.00	22		Do.
AP 6478	do	do	132	58.75	17		Do.
AP 6479	do	do	198	65.00	27		Wig.
AP 6480	do	do	138	59.50	19		Do.
G 5999	June 10, 1918	St. George	.....	.....	37		Wig.
G 6000	June 12, 1918	do	151	59.00	20		Do.
G 6001	June 15, 1918	do	158.75	58.75	34	12	Do.
G 6002	do	do	182.25	60.75	28		Do.
G 6003	June 17, 1918	do	171.25	62.00	23		Do.
G 6004	June 21, 1918	do	126	57.50	18		Do.
G 6005	June 26, 1918	do	318	64.50	27		Do.
G 6006	do	do	235	60.00	25	8	Do.
G 6007	July 1, 1918	do	264.50	63.25	25		Do.
G 6008	do	do	177	60.50	23		Do.
G 6009	do	do	155	58.00	20	8	Extra extra large.
G 6010	July 5, 1918	do	275	69.75	45		Wig.
G 6011	do	do	200	61.75	26	8	Do.
G 6012	July 31, 1918	do	117	57.00	14	8	Extra extra large.

[a] Seals were bled before being weighed.
[b] For new trade classification names, see table, p. 98.

The records of these branded seals are of very great importance, because they show the range of variation in the size of each age class. There has not been found any single external characteristic which can be relied upon absolutely for the differentiation of one age from that above or below it. The weighing of the skin is very unreliable as an indication of age, as the weight varies according to the condition of each animal and the manner in which the skin is removed from the carcass. The weight of animals in any class is likewise subject to great variation, depending entirely upon their physical condition when killed. The length of the body from the tip of the nose to the base of the tail also varies; there is an overlapping in this respect of any three consecutive age classes. A sufficient number of the branded animals of each age up to 6 years have been killed, however, to show the extremes of length of the majority of each class.

It is reasonable to assume that the remainder of the herd is subject to the same variations as the branded animals, so that when these points separating the several ages are found for the latter they can be used as standards for the classification of all animals which may be killed.

Owing to the fact that the seals obtain a considerable part of their growth during the summer season, the lengths in summer are not applicable to animals which may be killed in the fall; the number of branded animals, however, which have been killed in the fall is not sufficient to make the results of computations based on them entirely satisfactory. Such information as there is leads to the belief that the addition of 2 inches to the maximum and minimum lengths as found for summer seals is sufficiently accurate for the segregation of those taken in the fall. The fall killings are small anyway, being made largely in order to provide food for the natives for winter, and are insignificant in comparison with the total number killed.

The following table shows the measurements which will be used in making the age classification of all seals killed in 1919:

AGE STANDARDS OF BODY LENGTHS OF FUR SEALS.

Age.	Lengths of summer seals.	Lengths of fall seals.
	Inches.	*Inches.*
Yearlings	Up to 36.75	Up to 38.75
2-year-olds	37 to 40.75	39 to 42.75
3-year-olds	41 to 45.75	43 to 47.75
4-year-olds	46 to 51.75	48 to 53.75
5-year-olds	52 to 57.75	54 to 59.75
6-year-olds	58 to 63.75	60 to 65.75

AGE CLASSIFICATION OF SEALS KILLED.

Whenever seals are killed on the Pribilof Islands the lengths are taken by means of a pair of beam calipers. These records enable the age classification by comparison with the standards derived from the measurements of branded animals of known age. This work is highly important because it enables for the first time the securing of definite information regarding the number of animals in a particular age class, and any required reserves can thus be determined with accuracy.

In order to complete the record of seals killed on the Pribilof Islands in the calendar year 1917, the following table is presented to supplement the information contained in the table on page 118 of the report of Alaska Fisheries and Fur Industries in 1917, which contained information only as to the ages of seals taken in the summer sealing season of 1917:

AGES OF SEALS KILLED ON THE PRIBILOF ISLANDS FROM AUG. 10 TO DEC. 31, 1917.[a]

Age.	St. Paul.	St. George.	Total.
Yearlings	1		1
2-year-olds	161	18	179
3-year-olds	712	495	1,207
4-year-olds	261	135	396
5-year-olds	30		30
Unmeasured	1		1
Total	1,166	648	1,814

[a] The few cows which were killed accidentally are classified in the tables along with the males in order to make the record complete. The final result arrived at is not appreciably affected thereby.

The ages of all seals killed in the calendar year 1918 have been computed as follows:

AGES OF SEALS KILLED ON THE PRIBILOF ISLANDS IN THE CALENDAR YEAR 1918.[a]

Age.	Summer, 1918.			Fall, 1918.			Grand total.
	St. Paul.	St. George.	Total.	St. Paul.	St. George.	Total.	
Yearlings	12	1	13	2		2	15
2-year-olds	198	53	251	13	1	14	265
3-year-olds	12,706	3,748	16,454	239	313	552	17,006
4-year-olds	9,468	1,718	11,186	199	30	229	11,415
5-year-olds	3,528	766	4,294	123	25	148	4,442
6-year-olds	702	326	1,028	38	15	53	1,081
7-year-olds	259	388	647	8	3	11	658
Unclassified	8		8				8
Total	26,881	7,000	33,881	622	387	1,009	34,890

[a] The few cows which were killed accidentally are classified in the tables along with the males in order to make the record complete. The final result arrived at is not appreciably affected thereby. See p. 119 for details regarding the cows.

CLASSIFICATION OF SEALSKINS FOR THE TRADE.

The names which have in the past been applied to the various sizes of sealskins were arbitrarily chosen and bore no relation whatever to the age of the animal. They conflicted with the terminology which has come to be recognized throughout the world in its application to the living animals. Thus under the old trade names the word "pups" entered into four designations which might include animals from 1 to 4 years old, inclusive, but which never referred to those to which the term "pups" is properly applicable. The young of the year in which born have always been known by this name, but their skins have never been on the market.

In order to do away with this anomalous condition and prevent confusion in the minds of the uninformed, a new set of names was adopted

in 1918 for the several sizes of skins which bear no age relation to the animals at all. The sizes of the grades were not changed. The following table shows the equivalents.

TRADE CLASSIFICATION OF SEALSKINS.

Old names.	New names.	Lengths.
		Inches.
Wigs	Wigs	Above 55
Middlings	Extra extra large	49 to 55
Middlings and smalls		
Smalls	Extra large	46 to 48
Large pups	Large	43 to 45
Middling pups	Mediums	39 to 42
Small pups	Small mediums	35 to 38
Extra small pups		

This terminology was used in the two public-auction sales at St. Louis in 1918 and was accepted by the trade without confusion.

CENSUS.

A census of the seal herd was taken in 1918 at the usual time by employees of the Bureau. An increase of the number of cows slightly greater than the normal which has prevailed for several years is encouraging. Slight differences in methods of computation have been instituted as the knowledge of death rates and other factors have required. Complete information on this subject is given in the report by G. Dallas Hanna published herewith.

Following is a statement showing the numerical strength of the herd in 1918 as compared with the six preceding years:

GENERAL COMPARISON OF RECENT CENSUSES OF THE SEAL HERD.

Class of seals.	1912	1913	1914	1915	1916	1917	1918
Harem bulls	1,358	1,403	1,559	2,151	3,500	4,850	5,344
Breeding cows	81,984	92,269	93,250	103,527	116,977	128,024	142,915
Surplus bulls						8,977	17,110
Idle bulls	113	105	172	673	2,632	2,706	2,444
Young bulls (chiefly 5-year-olds)	199	259	1,658				
6-year-old males					11,167	15,397	13,755
5-year-old males				11,271	15,494	14,813	11,941
4-year-old males	100	2,000	9,939	15,848	15,427	16,631	7,114
3-year-old males	2,000	10,000	13,880	18,282	19,402	19,507	9,117
2-year-old males	11,000	15,000	17,422	23,990	24,169	26,815	30,159
Yearling males	13,000	20,000	23,068	30,307	33,645	38,013	41,595
2-year-old cows	11,000	15,000	17,422	23,990	24,245	26,917	30,415
Yearling cows	13,000	20,000	23,067	30,306	33,646	38,018	41,608
Pups	81,984	92,269	93,250	103,527	116,977	128,024	142,915
Total	215,738	268,305	294,687	363,872	417,281	468,692	496,432

SPECIMENS OF FUR SEALS FOR SCIENTIFIC PURPOSES.

From time to time calls are made upon the Bureau by scientific institutions for specimens of the Alaska fur seal for exhibition or other purposes. There is no authority in law whereby animals may be killed to supply this demand. A few cows and bulls and a considerable number of pups are found dead on the rookeries each year, however, and these afford a means of filling such requirements.

In 1916 the California Academy of Sciences made a request for sufficient material to enable a mounted group to be installed in its museum in San Francisco. It was not practicable to secure sufficient animals at the Pribilofs for this purpose until in 1918. In all, 13 pups and 16 older seals, a total of 29 specimens, were collected and shipped to this institution in 1917 and 1918. The records of these animals were made separately from the regular take of skins.

Existing law requires that all sealskins from the Pribilof Islands shall be sold and the proceeds covered into the Treasury. In arriving at a price to be fixed for such specimens from dead animals, consideration has been taken of the fact that many of them are worthless commercially and for others it would be difficult to obtain an equitable appraisement. Therefore, the sum of $1 each was fixed as the value of the pups and $5 each for all older animals. The institution securing the specimens paid all charges for labor and transportation connected therewith.

DEATH OF FUR SEALS AT AQUARIUM.

The two Alaska fur seals which have been at the Washington aquarium of the Bureau since the summer of 1909 died in 1918, the female on September 1 and the male on September 25. Autopsies were performed by experts of the Bureau of Animal Industry and showed the cause of the death of the female to be congestion of the lungs, and of the male to be acute general enteritis, perhaps of bacterial origin.

These two seals were born at St. Paul Island, Bering Sea, in July, 1909. Shortly afterwards they were found to be waifs whose mothers had been killed at sea by hunters, and they would have starved to death, as so many thousands of their kind did every year, had they not been bottle-fed during the early weeks of their existence. They were the only Alaskan fur seals which have borne confinement more than a year or two. Several lots brought to the States as pups and distributed to aquaria and zoological gardens succumbed in a short time. An interesting fact is that whereas in nature fur seals never enter fresh water, these particular individuals had never been in salt water.

FOXES.

SEASON OF 1917–18.

Only one species of fox is found on the Pribilofs, *Vulpes pribilofensis* Merriam. It appears in both the blue and white color phases, with the former predominating. In fact, through the system of capture employed on St. George Island since 1897, the proportion of white foxes has been reduced to a negligible factor. On St. Paul approximately 25 per cent of the skins secured are white. Pribilof Island blue foxes have long been considered the best which reach the markets. Although there is a small percentage of poorer grades, as would be expected among so large a number, in the main the fur is long, dark, and silky.

The method of feeding and trapping established on St. George Island in 1897 by James Judge has been highly successful. The Bureau plans to take active steps to establish it in the near future on St. Paul Island.

St. George Island.—The following extract from the report of Agent A. H. Proctor on foxing operations on St. George Island for the season 1917–18 was written on October 31, 1918, and gives interesting details of the work.

The presence of the U. S. F. S. *Roosevelt* at the islands discharging cargo delayed trapping operations until the night of December 19, 1917. The *Roosevelt* made her final departure December 17, and two nights later trapping for skins began, and continued at suitable intervals until the night of February 8, 1918, when operations were suspended for the season. The trap at the village was operated, in all, 24 nights, that at Zapadni 11 nights, and string traps were used in the village proper three afternoons. Trapping at the village trap and at Zapadni was concurrent.

As noted in the accompanying record, two mangy males whose bodies were entirely denuded of hair or fur were shot in the village, and as their skins were worthless they were publicly burned. These animals were killed to prevent them from spreading the mange.

During the trapping season there were killed for skins 320 blue males and 279 blue females, 2 white males, and 3 white females; a total of 604 skins. To that total were added the skins of three blue males which were found dead, bringing the total number of skins for shipment to 607. The entire shipment was forwarded on the *Roosevelt* June 21, 1918.

Including the 3 found dead, 1,017 foxes were handled during the season. Of that number 200 males and 208 females were branded and released for breeders. Following the established practice, all animals unfit for breeders that entered the trap were killed, but in order to produce present revenue, and for the better reason that the herd could well afford it, a proper percentage of animals bearing a higher grade of pelt were also killed.

The breeders, 200 blue males and 208 blue females, consisted of the finest specimens that passed through the trap, and considered as a whole they were very high grade in every respect. Those released for breeders received a mark that identified them and secured them immunity from killing at a later period in the season. Males were branded or marked by clipping a broad ring from the fur near the end of the tail; females were similarly marked, but the band was clipped near the base of the tail. These marks remained until the coat was shed the following summer. No male that weighed less than 10½ pounds nor a female that weighed less than 7½ pounds were reserved for breeding. All were in such fine condition that none were released that even approximated those weights.

The season of 1917–18 was in every respect the most successful one for 25 years. The most recent season that approaches it was that of 1905–6, when 1,062 foxes were handled, but in that year only 481 were killed. In point of number of skins secured the past season was exceeded only by that of 1892–93, when 928 skins were secured. The large take of 1917–18 followed immediately after the large catch of the previous season, and clearly demonstrates the wonderful increase that has taken place within the past few years. This is further demonstrated by the ease with which the catch was secured, as is shown by the accompanying record.

After the close of trapping operations reliable persons report having seen large numbers of unbranded foxes at large at various points on the island, and many were also observed in the vicinity of the village and at the feeding ground. No reliable estimate can be made of the number of foxes alive at the close of trapping, but it is more than safe to say that the 200 pairs released for breeders represented far less than one-half of the number. The presence of unbranded foxes after the close of trapping operations shows conclusively that all do not resort to the village to feed, at least during the hours when the trap is in operation. This is, of course, not true of them all, as some branded animals have been seen at the most remote points. Zapadni appears to have a colony that rarely visits the village, and the same appears to be true of Garden Cove. Recognizing that, it has been customary to preserve food at Zapadni for winter's use, and this season 200 seal carcasses were preserved there, and at this writing something less than one-half of it has been consumed.

The first night of trapping invariably is the best, and the number then handled may be accepted as a good indication (weather conditions remaining favorable) of what the final take may be. On the first night of 1917–18 we killed 197 foxes, and then had to suspend operations early and while they were coming to the trap in increasing numbers, because our shoproom was too small to permit us to stretch and dry a greater number. The same lack of shoproom made it impracticable for us to resume trapping before December 27, eight days after the first night. On the second night we killed 133. These two nights, it is believed, exceed any similar record since the present trapping method was established in 1897.

During the remainder of the season foxes gathered about the trap in large numbers nightly, but many had become trap-shy and could not be induced to enter in anything approximating the number taken during the first two nights. Contrary to the writer's previous experience, not one night was a failure. The nearest to a failure was the night of January 11, when only one fox was caught, and this is accounted for by the fact that during all that day and up to within two hours of opening the trap a gasoline engine was in operation within 100 feet of the trap, and it is certain that the noise and odor of the engine kept foxes away until very late at night. That night an unusually large amount of food was placed outside the trap after the latter was closed, and by morning it was entirely consumed, thus showing that a large number had fed there later in the night. After that experience bone grinding was postponed until after fox trapping closed for the season.

From early in May until about September 15 foxes find abundant food on the cliffs and in the rocks where the birds nest thickly. The bird migration is practically over by September 15 and by that date the foxes seek food elsewhere. The beaches furnish a limited amount under ordinary conditions and at rare intervals a whale or sea lion is washed up, but such food supplies at that season can not be depended upon and in consequence preserved food must be supplied. Feeding at the trap began September 15 and was continued until May 8 until least auklets (choochkies) and other birds appeared in sufficient numbers to provide a food supply more to their taste, when the foxes ceased to visit the village feeding ground.

For more than 20 years food has been the one great and constant problem in fox propagation on this island. Previous to that time the large number of seals killed annually and left on the killing fields provided a supply ample to sustain a very large fox herd. As seal killings diminished, fox life decreased. In 1897 Assistant Agent James Judge began preserving seal carcasses in an abandoned silo. These carcasses were taken out, freshened, and fed during the winter. This experiment met with such success that it has been followed ever since. But for a number of years sufficient seal carcasses were not available and the food supply was to some extent added to by the purchase of salted salmon and other fish and on one occasion whale meat.

During the summer of 1917 the viscera and other waste portions of seals were preserved in the silo, and that together with a portion of the meat from the large number of seals killed during the late fall furnished the largest supply of food for a number of years and enabled the herd to secure an ample amount of nourishing food throughout the winter and spring. As a result the females were strong and brought a larger percentage of their young through the nursing period.

Taking 7,000 seals during the sealing season of 1918, for the first time in many years, provided sufficient meat in excess of the natives' requirements to enable us to preserve a large supply for the foxes. Early in the summer it was seen that the one silo would not suffice and work was at once begun on another. It was completed and filled before the close of the sealing season and about 300 carcasses from the last killings of the season had to be left on the killing field. Flesh decays slowly here and the carcasses on the killing field furnished ample food for the young and old after the birds began to leave.

Following the plan begun in 1916, a pipe-line was laid on top of the ground early in October from the silos to the standpipe in the siphon line connecting the village with Upper Lake. Fresh water was run into the silos for four weeks and the small amount of salt sprinkled over the carcasses when they were placed in the silos was thoroughly washed away. The meat so preserved is remarkably firm, but is very high and seems to be relished by foxes. It is this meat that is being fed out nightly. While this partially putrid meat furnishes their principal food supply during the winter months, the foxes secure a varying amount from the beaches, and it is not unusual for them to entirely desert the village feeding ground when sea food becomes abundant along the beaches.

Young foxes make their first appearance about the entrance of the warrens early in June, and this year it was seen that litters brought to that age were unusually large and well nourished. As fall came on the inexperienced young had ample food close at hand and they were seen feeding on the old killing field in large numbers, and by October the three hundred odd carcasses gave evidence of their activities. The foregoing applies particularly to the litters in and about the village, but visits to Zapadni, Staraya Artil, Garden Cove, and the vicinity of East Rookery showed that the young in those sections were in exceedingly fine condition and families were large.

In September, 1918, a pair of young foxes was secured from Sagchudak Island, an islet near the southern shore of Atka Island of the Aleutian Group. They were secured in exchange for a pair of young foxes from the St. George herd. The transfer was authorized by the Bureau in a telegram dated September 5, 1918, and the trade was made with Reverend Mr. Hotovitsky, of Unalaska, who, it is believed, is engaged in

fox raising in some part of the Aleutians. The new foxes were permanently marked by clipping the top of the right ear and slitting the left. They were kept under treatment until the wounds healed and were then released. They immediately took up their residence under the boardwalk leading to the radio station, where they have since lived. They are frequently seen and are in excellent condition.

The physical and numerical strength of the herd warrants a take of skins materially in excess of that of last year, and it is not unlikely that approximately 900 skins may be secured. A greater number would not weaken the herd, and it is my opinion, based upon my own observations and reliable reports from others, that a take of 1,000 would not represent the year's increment.

Aside from the number of foxes, the weather during trapping time is a material factor which must be considered. Cold, clear nights when the tide is high, are the best, and on such nights good catches are to be expected.

The production of animals with the best grade of pelts is one of the objects we are aiming at, but it is a question whether the finest pelts can be produced so long as the herd is forced to subsist largely upon carrion. The commercial value of the herd is great enough to warrant serious consideration being given to the erection of a cold-storage plant in which 2,000 or more seal carcasses could be preserved in a frozen state to be fed fresh to the foxes during the winter. While such a number of carcasses would in itself be insufficient to subsist the herd, its prophylactic value would be great when used to vary the diet.

From an economic point of view no better way of disposing of seal carcasses can be found than that of converting them into food for the blue-fox herd. Many years will pass before the number of seals killed on St. George will exceed the combined needs of the natives and the fox herd.

The experience of last season demonstrated that the fox herd has outgrown the limits of our present shop and that a much larger building is required for drying and stretching the pelts unless the take of skins is to be kept within the limit of the present small building. During the coming trapping season it is proposed to utilize the least-finished native dwelling for drying skins, but that building will be available for the one season only.

RECORD OF FOXES TRAPPED ON ST. GEORGE ISLAND, ALASKA, SEASON 1917–18.

Serial number of killing.	Date.	Where taken.	Blue.		White.		Found dead.[a]	Marked and released as breeders.[a]	
			Male.	Female.	Male.	Female.	Male.	Male.	Female.
	1917.								
.....	Nov. 26	Village	.....	.....	.....	.....	1	.....	.....
.....	Nov. 27	.....do	.....	.....	.....	.....	1	.....	.....
1.....	Dec. 19	Village trap	114	83	.....	.....	.....	3	4
2.....	Dec. 27	.....do	73	59	1	.....	.....	8	11
	1918.								
3.....	Jan. 2	Village trap	9	8	.....	.....	.....	6	9
4.....	Jan. 3	.....do	5	10	.....	.....	.....	2	1
5.....	Jan. 4	.....do	8	5	.....	.....	.....	7	6
6.....	Jan. 9	.....do	16	21	.....	.....	.....	12	14
7.....	Jan. 11	.....do	.....	1	.....	.....	.....	.....	.....
8.....	Jan. 14	.....do	9	9	.....	.....	.....	1	4
9.....	Jan. 16	.....do	17	11	.....	.....	.....	7	9
10.....	Jan. 20	.....do	20	1	.....	.....	.....	8	11
11.....	Jan. 21	.....do	8	11	.....	1	.....	9	9
12.....	Jan. 22	.....do	4	3	1	.....	.....	6	14
13.....	Jan. 23	.....do	5	4	.....	.....	.....	22	21
14.....	Jan. 25	.....do	2	3	.....	.....	.....	15	13
.....	Jan. 27	Village (shot)	1	.....	.....	.....	.....	.....	.....
15.....	Jan. 28	Village trap	2	7	.....	.....	.....	.....	1
16.....	Jan. 29	.....do	3	7	.....	.....	.....	2	3
.....	Jan. 30	Village (shot)	(b)	.....	.....	.....	.....	.....	.....
1.....	Jan. 24	Zapadni	.....	.....	.....	.....	.....	[c] 1	.....
2.....	Jan. 25	.....do	.....	.....	.....	.....	.....	1	1

[a] All blue.
[b] An animal entirely devoid of hair or fur was shot; skin publicly burned in shop stove.
[c] This animal weighed 24 pounds.

RECORD OF FOXES TRAPPED ON ST. GEORGE ISLAND, ALASKA, SEASON 1917–18—Continued.

Serial number of killing.	Date.	Where taken.	Blue.		White.		Found dead.[a]	Marked and released as breeders.[a]	
			Male.	Female.	Male.	Female.	Male.	Male.	Female.
	1917.								
3	Jan. 26	Zapadni						2	4
4	Jan. 27	do	1	1					
5	Jan. 28	do	1						
6	Jan. 29	do	1	1					
17	Jan. 30	Village trap	1	2				2	
18	Jan. 31	do	[b] 2	1				6	10
	31	Village (string trap)		1				2	5
7	31	Zapadni	1						
19	Feb. 1	Village trap	3	4				18	10
	1	Village (string trap)	1						3
20	Feb. 3	Village trap	3	14				18	7
	3	Shot				1			
	Feb. 4	Village (string trap)	1	1				13	11
21	4	Village trap	3	5				10	7
22	Feb. 5	do	3	5				9	7
8	Feb. 1	Zapadni	3						
9	Feb. 3	do						2	1
10	Feb. 4	do						1	1
11	Feb. 5	do						1	
23	Feb. 6	Village trap		1				1	3
	6	Village (shot)				1			
24	Feb. 8	Village trap						5	8
	Mar. 1	Village					1		
Total			320	279	2	3	3	200	208

[a] All blue.
[b] One additional male was killed, body devoid of hair; skin publicly burned in shop stove.

St. Paul Island.—The foxes on St. Paul Island run wild and are captured in steel traps. No selection can thus be made for a breeding reserve and the dangers of overtrapping are obvious. For some reason not adequately explained this island has never been the equal of St. George for foxes, although it is larger, has more extensive beach areas, and about seven times as large a seal herd.

At the present time fox life seems to be at a low ebb. In 1917–18 10 days' trapping under excellent weather conditions and with about 300 more traps in use than for several years previous resulted in a catch of only 104 animals, whereas, in the winter of 1914–15 over 200 pelts were secured in this time. It is entirely possible to practically exterminate the animals here if very close supervision is not given. It is planned to make a thorough attempt to institute the Judge system of feeding and selection at an early date. If it can be made a success on St. Paul Island, the dangers of overtrapping will disappear and will, it is hoped, bring the St. Paul herd to a high state of excellence.

PAYMENTS TO NATIVES.

The natives are paid $5 from the proceeds of the sales for each fox skin secured. Since this is in return for labor performed, no distinction is made between the white and blue pelts. The work required is the same on each. On St. Paul Island the pelts brought in by each native are credited to him. This plan can not be followed on St. George Island because of the manner of taking and killing.

Accordingly, a division of the total for the community is made and each man entitled to a share is credited with his proportion. The more skillful persons receive the largest shares. Thirty-nine natives of St. Paul Island earned $520 for the taking of 90 blue and 14 white foxes. After the checks were stated, Innokenty Sedick died and the amount of $5 which was due him was equally divided between three of his heirs. Twenty-six natives of St. George Island earned $3,035 for the taking of 602 blue and 5 white foxes.

SEASON OF 1918–19.

On St. Paul Island the extent of trapping was left to the judgment of Agent Fassett. On December 15, 45 natives with 8 traps each, making a total of 320 traps, began operations. The traps were left out 5 days, or until December 19, and the result was 119 blue and 25 white pelts, a total of 144. As unusually favorable conditions prevailed, no further trapping was recommended by the agent. Upon the close of trapping, the feeding of processed seal meat from the by-products factory was instituted each week at three different places.

On St. George Island trapping began December 16, and at the end of the month 339 blue and 3 white skins had been secured. During January 202 blue skins were secured, making the total to the end of the month 541 blue and 3 white, or 544 altogether. Since the animals were reported mating on that date, trapping was restricted to mangy and other animals unfit for breeders. Of these, 7 blue and 2 white were secured in February.

Agent Proctor telegraphed that the small catch was due to the stranding of a large whale under the high bluffs and its subsequent breaking up and drifting to all beaches. An abundant food supply was thus provided, so that the foxes were not obliged to resort to the station. Foxes appeared abundant and all were very fat.

SUMMARY OF 1918–19 FOX CATCH.

	Blue.	White.	Total.
St. Paul Island	119	25	144
St. George Island	548	5	553
Total	667	30	697

REINDEER.

The reindeer herds on St. George Island and St. Paul Island have continued to increase very satisfactorily. The surplus males furnish a limited amount of food, which takes the place of fresh beef to a very large extent. It is planned that at no very distant time the islands shall be practically self-supporting in the way of fresh meat from this and other sources.

On St. Paul Island in the summer of 1918 there were 160 animals, including 40 fawns. Two were killed and three others in poor physical condition probably died, leaving a total of 155 in the herd at the close of the calendar year.

On St. George Island there were reported 114 of all sizes at the end of the calendar year. This brings the total up to 269 for both islands,

as compared with 154 for 1915. A total of 20 animals was used for food on both islands during 1918.

Since the reindeer subsists during the winter upon one or two species of lichens, which are of very slow growth and of limited distribution on the Pribilofs, the Bureau plans to institute an inquiry into the probable maximum size of herds which can be continually maintained on each island.

BIRDS.

During the course of several years at the Pribilof Islands, Dr. G. Dallas Hanna has from time to time devoted considerable study to the enormous numbers of birds in that region. As the result of his observations the following has been recently submitted by Dr. Hanna:

The enormous numbers of sea birds which nest on the Pribilof Islands form one of the most interesting spectacles to be found there. Some of the species have been estimated in millions.

Many employees have given the subject a share of attention during their residence there, and the islands have thus come to be better known in this respect than any similar area in Alaska. Collections have been sent in from time to time, and almost without exception they contained some species which attracted unusual attention. Stragglers arrive from all directions and a considerable number of them may be expected every year. The total number of species which breed or are found regularly in migration is only 45; but the number of stragglers has swelled the list to 129. Of these no less than 14 represent the first records of the species having been secured in North America. Five others were originally described from this locality.

Specimens have been collected of all except 6 of these 129 species, and of those collected the U. S. National Museum possesses specimens from the islands of all but one.

While it is impracticable at the present time for any of the Pribilof employees to devote much time to the collection of birds, owing to the shortage of assistants, the Bureau encourages the preservation of any specimens which may appear strange or which possess some unusual interest.

The list which follows was originally prepared by Dr. C. W. Richmond, of the National Museum, for use on the islands in recognizing other desirable species. It has been added to by the present writer after completing the study of the last collection he brought from the islands. Names have been corrected and slight changes made by Dr. H. C. Oberholser, of the Bureau of Biological Survey.

CHECK LIST OF BIRDS OF THE PRIBILOF ISLANDS, ALASKA, WITH THE NAMES OF PERSONS FIRST RECORDING THE SPECIES FROM THE ISLANDS.

Colymbus holbœllii. Holbœll's Grebe. Elliott.

Colymbus auritus. Horned Grebe. Hanna.

Gavia adamsi. Yellow-billed Loon. Townsend.

Gavia arctica. Black-throated Loon. Elliott.

Lunda cirrhata. Tufted Puffin.[a] Coinde.

Fratercula corniculata. Horned Puffin.[a] Elliott.

Phaleris psittacula. Paroquet Auklet.[a] Coinde.

Æthia cristatella. Crested Auklet.[a] Coinde.

Æthia pusilla. Least Auklet.[a] Coinde.

Synthliboramphus antiquus. Ancient Murrelet. Dall and Bannister.

Brachyramphus marmoratus. Marbled Murrelet. Hanna.

Cepphus columba. Pigeon Guillemot.[b] Nelson.

Uria troille californica. California Murre.[a] Elliott.

Uria lomvia arra. Pallas's Murre.[a] Dall and Bannister.

Coprotheres pomarinus. Pomarine Jaeger. Elliott.

Stercorarius parasiticus. Parasitic Jaeger. Elliott.

Stercorarius longicaudus. Long-tailed Jaeger. Elliott.

Rissa tridactyla pollicaris. Pacific Kittiwake.[a] Coinde.

Rissa brevirostris. Red-legged Kittiwake.[a] Coinde.

Pagophila alba. Ivory Gull. Palmer.

Larus hyperboreus hyperboreus. Glaucous Gull.[a] Oberholser.

Larus hyperboreus barrovianus. Palmer.

[a] Species which breed regularly. The mallard and green-winged teal have also been known to nest on St. Paul once each.

[b] Regular migrants.

Larus glaucescens. Glaucous-winged Gull.[a] ELLIOTT.
Larus schistisagus. Slaty-backed Gull.[b] PALMER.
Rhodestethia rosea. Ross's Gull. 2 specimens. EVERMANN.
Xema sabini. Sabine's Gull.[c] PALMER.
Sterna paradisæa. Arctic Tern.[c] PALMER.
Phœbastria albatrus. Short-tailed Albatross. ELLIOTT.
Fulmarus glacialis rodgersii. Rodgers's Fulmar.[a] DALL and BANNISTER.
Puffinus tenuirostris. Slender-billed Shearwater. HANNA.
Oceanodroma furcata. Forked-tail Petrel. PALMER.
Phalacrocorax pelagicus robustus. Violet-green Cormorant.[c] BAIRD, BREWER and RIDGWAY.
Phalacrocorax urile. Red-faced Cormorant.[a] COINDE.
Mergus americanus. Merganser. DALL.
Mergus serrator. Red-breasted Merganser. EVERMANN.
Anas platyrhyncha. Mallard.[c] ELLIOTT.
Chaulelasmus streperus. Gadwall. EVERMANN.
Mareca penelope. European Widgeon.[d] ELLIOTT.
Eunetta falcata. Falcated Teal.[d] HANNA.
Nettion crecca. European Teal. HANNA.
Nettion carolinense. Green-winged Teal.[c] PALMER.
Spatula clypeata. Shoveller. EVERMANN.
Dafila acuta. Pintail.[c] EVERMANN.
Aristonetta valisineria. Canvas-back. HANNA.
Marila fuligula. Tufted Duck.[d] EVERMANN.
Marila ferina. Pochard. EVERMANN.
Marila marila. Scaup Duck. EVERMANN.
Clangula clangula clangula.[d] European Golden-eye. HANNA.
Clangula clangula americana. Golden-eye. HANNA.
Charitonetta albeola. Buffle-head. HANNA.
Harelda hyemalis. Old-squaw.[a] ELLIOTT.
Histrionicus histrionicus pacificus. Pacific Harlequin Duck.[c] ELLIOTT.
Polysticta stelleri. Steller's Eider.[c] ELLIOTT.
Arctonetta fischeri. Spectacled Eider. HANNA.
Somateria v-nigra. Pacific Eider.[c] PALMER.
Erionetta spectabilis. King Eider.[c] EVERMANN.
Melanitta deglandi dixoni. Pacific White-winged Scoter.[c] HANNA.
Chen hyperborea hyperborea. Snow Goose. HANNA.
Anser albifronsalbi frons. White-fronted Goose. PALMER.
Branta canadensis hutchinsii. Hutchins's Goose. HANNA.
Branta canadensis minima. Cackling Goose.[c, e] ELLIOTT.
Branta nigricans. Black Brant. HANNA.
Philacte canagica. Emperor Goose.[c] ELLIOTT.
Olor columbianus. Whistling Swan. PALMER.
Grus canadensis canadensis. Little Brown Crane.[b] TOWNSEND.
Phalaropus fulicarius. Red Phalarope.[c] ELLIOTT.
Lobipes lobatus. Northern Phalarope.[a] ELLIOTT.
Arquatella maritima couesi. Aleutian Sandpiper. SEALE
Arquatella maritima ptilocnemis. Pribilof Sandpiper.[a, e] DALL and BANNISTER.
Pisobia maculata. Pectoral Sandpiper.[c] PALMER.
Pisobia acuminata. Sharp-tailed Sandpiper.[c] BISHOP.
Pisobia bairdii. Baird's Sandpiper. HANNA.
Pisobia minutilla minutilla. Least Sandpiper. HANNA.
Pisobia subminuta. Long-toed Stint.[d] RIDGWAY.
Pelidna alpina sakhalina. Red-backed Sandpiper. BISHOP.
Ereunetes pusillus. Semipalmated Sandpiper. PALMER.
Vetola lapponica baueri. Pacific Godwit.[c] ELLIOTT.
Totanus flavipes. Yellow-legs. PALMER.
Totanus melanoleucus. Greater Yellow-legs.[f] SEALE.
Rhyacophilus glareola. Wood Sandpiper. HANNA.
Heteroscelus incanus. Wandering Tattler.[c] ELLIOTT.
Heteroscelus brevipes. Polynesian Tattler.[d] HANNA.
Philomachus pugnax. Ruff. EVERMANN.
Phæopus hudsonicus. Hudsonian Curlew.[b] PALMER.
Phæopus borealis. Eskimo Curlew. ELLIOTT.
Phæopus tahitiensis. Bristle-thighed Curlew. HANNA.
Pluvialis dominica fulva. Pacific Golden Plover.[c, d] COINDE.
Charadrius semipalmatus. Semipalmated Plover. PALMER.

[a] Species which breed regularly. The mallard and green-winged teal have also been known to nest on St. Paul once each.
[b] Species which have been recorded but of which no specimens have apparently been collected.
[c] Regular migrants.
[d] Species from the Pribilof Islands which constitute the first records for North America.
[e] Species originally described from the Pribilof Islands.
[f] A specimen has been collected but it is not in the National Museum.

Arenaria interpres interpres. Turnstone.[a] COINDE.
Hæmatopus bachmani. Black Oystercatcher. HANNA.
Archibuteo lagopus sancti-johannis. Rough-legged Hawk. HANNA.
Thallasoaëtus pelagicus. Kamchatkan Sea Eagle.[b] HANNA.
Haliæetus leucocephalus alascanus. Northern Bald Eagle.[c] PALMER.
Hierofalco rusticolus candicans. Gyrfalcon.[a] ELLIOTT.
Rhynchodon peregrinus anatum. Duck Hawk.[c] PALMER.
Rhynchodon peregrinus pealei. Peale's Falcon. HANNA.
Asio flammeus flammeus. Short-eared Owl. PALMER.
Cryptoglaux funerea funerea. Tengmalm's Owl.[b] EVERMANN.
Cryptoglaux funerea richardsoni. Richardson's Owl. EVERMANN.
Nyctea nyctea. Snowy Owl.[a] PALMER.
Cuculus canorus telephonus. Kamchatkan Cuckoo.[b] PALMER.
Colaptes auratus luteus. Northern Flicker. CLARK.
Euphagus carolinus. Rusty Blackbird. EVERMANN.
Coccothraustes coccothraustes japonicus. Japanese Hawfinch.[b] EVERMANN.
Pinicola enucleator kamtschatkensis. Kamchatkan Pine Grosbeak.[b] RILEY.
Leucosticte tephrocotis griseonucha. Aleutian Rosy Finch.[d] DALL and BANNISTER.
Acanthis hornemannii exilipes. Hoary Redpoll. HANNA.
Acanthis linaria linaria. Redpoll.[a] ELLIOTT.
Spinus pinus pinus. Pine Siskin. HANNA.
Plectrophenax nivalis nivalis. Snowflake. EVERMANN.
Plectrophenax nivalis townsendi. Pribilof Snowflake.[d, e] DALL and BANNISTER.
Plectrophenax hyperboreus. McKay's Snowflake. HANNA.
Calcarius lapponicus alascensis. Alaska Longspur.[d, e] ELLIOTT.
Passerculus sandwichensis sandwichensis. Aleutian Savannah Sparrow. PALMER.
Zonotrichia gambeli. Gambel's Sparrow. EVERMANN.
Junco hyemalis hyemalis. Slate-colored Junco. HANNA.
Melospiza melodia sanaka. Aleutian Song Sparrow. HANNA.
Passerella iliaca sinuosa. Valdez. Fox Sparrow. EVERMANN.
Fringilla montifringilla. Brambling.[b] HANNA.
Petrochelidon lunifrons lunifrons. Cliff Swallow. HANNA.
Hirundo rustica erythrogastris. Barn Swallow.[c] PALMER.
Tachycineta thalassina lepida. Northern Violet-green Swallow. HANNA.
Wilsonia pusilla pileolata. Pileolated Warbler. HANNA.
Anthus spinoletta rubescens. Pipit.[a] PALMER.
Anthus spinoletta japonicus. Japanese Pipit.[b] HANNA.
Nannus alascensis. Alaska Wren.[d, e] DALL and BANNISTER.
Hylocichla aliciæ aliciæ. Gray-cheeked Thrush. HANNA.
Planesticus migratorius migratorius. Robin. ELLIOTT.
Œnanthe œnanthe œnanthe. Wheatear. SEALE.

DOGS PROHIBITED.

An order issued by the Secretary of Commerce on January 17, 1917, excludes all dogs from the Pribilof Islands. This was to prevent any possible disturbance of the fur seals and foxes. The order reads as follows:

In order to prevent molestation of the fur-seal and fox herds, the landing of any dogs at the Pribilof Islands is hereby prohibited. It is directed that any and all dogs now on the Pribilof Islands must be removed not later than July 1, 1917. Officials in charge of St. Paul and St. George Islands will enforce this order.

RADIO STATIONS.

The Navy Department continued the maintenance of radio stations on St. Paul and St. George Islands. These have been of inestimable value to the Bureau in the conduct of its operations. The value does not end with the official transmission of messages. Through the cooperation of the local representatives of both departments a great deal

[a] Regular migrants.
[b] Species from the Pribilof Islands which constitute the first records for North America.
[c] Species which have been recorded but of which no specimens have apparently been collected.
[d] Species which breed regularly. The mallard and green-winged teal have also been known to nest on St. Paul once each.
[e] Species originally described, from the Pribilof Islands.

is accomplished which otherwise would be impossible. The men at the radio stations ordinarily are skilled in mechanical and electrical work, and especially in the upkeep of gasoline engines. Accordingly they have given much valuable assistance and advice.

Through the cooperation of employees of the radio station on St. Paul Island it was possible to install the electric lights in the Government buildings as mentioned elsewhere in this report.

The Navy Department sent the U. S. S. *Saturn* to the islands in May, 1918, to carry supplies to the radio stations and make additions and repairs. On St. Paul Island an underground concrete food-storage cellar was constructed and a sewer was placed leading from the buildings to the sea. Other activities consisted largely of repairs and upkeep.

On St. George Island a building was constructed to serve as a power house and storage room, new masts were erected for the aerial, and a higher-powered transmission set was installed than had been previously in use.

PATROL OF THE NORTH PACIFIC OCEAN AND BERING SEA.

The usual patrol for the protection of migrating fur seals was maintained by the Coast Guard. The cutter *Unalga* left San Francisco about April 20, and carried on the patrol until October. The cutter *Bear* made the annual cruise to Arctic Alaska and then remained in Bering Sea until late in October, when a special trip to Seattle was made for the purpose of bringing out Assistant Agent Reynolds. Valuable assistance was also given the Bureau in the transportation of other passengers to the islands and the carrying of mail and supplies, for which courtesies acknowledgment is here made.

SEALING PRIVILEGES ACCORDED ABORIGINES.

Indians along the coast of Washington and Oregon availed themselves of the privileges granted under the North Pacific Sealing Convention of July 7, 1911, and the act of August 24, 1912, giving effect thereto, and in the season of 1918 a number of fur-seal skins were taken in accordance with law. Skins were authenticated by Dr. C. L. Woods, superintendent and physician, United States Indian Service, Neah Bay, Wash., who reported a total of 395 certificates issued and skins tagged by him in the year 1918. The records show that 251 of these skins were from male seals and 142 from females, while the sex of two was not recorded. These skins were taken in April, May, and June, 1918. It is thought that other skins may have been taken, but reports of authentication have not been received. Dr. Otis O. Benson, superintendent of the Taholah Indian Agency, Taholah, Wash., and Mr. A. H. Dodge, who has succeeded Dr. Woods at Neah Bay, have been authorized to authenticate all fur-seal skins properly taken by Indians under their jurisdiction.

SHIPMENT OF SKINS FROM PRIBILOF ISLANDS IN 1918.

Fur-seal skins.—The fur-seal skins were shipped in four lots in 1918. The first shipment left the islands June 22 on the Bureau's steamer *Roosevelt*, and consisted of 3,104 skins from St. Paul Island and 438 from St. George. The skins were delivered at Seattle and

forwarded on July 8, by Assistant Agent Christoffers, to Funsten Bros. & Co., St. Louis. The shipment was made by freight in two carloads over the Northern Pacific Railway, arriving at its destination July 29 and 30.

The second shipment of skins was made on September 14 on the steamer *Roosevelt*, and consisted of 17,816 skins from St. Paul Island. Continuous gales prevented the loading of any skins at St. George Island on this trip. The shipment was landed at Seattle and was forwarded on October 5 in four cars via the Northern Pacific Railway to St. Louis, reaching there October 30, 31, and November 1.

A third shipment of skins was made on the Coast Guard cutter *Bear*, and consisted of 1,978 skins loaded at St. George Island on October 6. They were landed at Seattle on November 5 and forwarded on the same day to Funsten Bros. & Co., St. Louis, arriving there November 25.

The final shipment of the season was made from the Pribilof Islands December 12 on the steamer *Roosevelt*, and consisted of 2,899 skins from St. Paul Island and 4,584 skins from St. George. The vessel reached Seattle January 3. The skins were forwarded to St. Louis January 4 in two cars via the Northern Pacific Railway, arriving at their destination January 29, 1919.

The following table shows details of the shipments:

SHIPMENTS OF SEALSKINS FROM PRIBILOF ISLANDS IN 1918.

Date.	Vessel.	Arrived Seattle.	St. Paul.		St. George.		Total.	
			Casks.	*Skins.*	*Casks.*	*Skins.*	*Casks.*	*Skins.*
June 22	Roosevelt	July 7	139	3,104	31	438	170	3,542
Sept. 14	....do	Oct. 3	528	17,816	.....	.....	528	17,816
Oct. 6	Bear	Nov. 5	.....	.....	56	1,978	56	1,978
Dec. 12	Roosevelt	Jan. 3	71	2,899	156	4,584	227	7,483
	Total	.....	738	23,819	243	7,000	981	30,819

The following statement shows the islands' record as to numbers of skins taken and shipped:

St. Paul Island:		
Number of skins on hand Jan. 1, 1918	112	
Number taken during year	27,503	
Total	27,615	
Shipped during year	23,819	
Number remaining on St. Paul Island		3,796
St. George Island:		
Number of skins taken during year	7,387	
Shipped during year	7,000	
Number remaining on St. George Island		387
Total on both islands Dec. 31, 1918		4,183

Fox skins.—The fox skins taken on the Pribilof Islands in the season of 1917–18 were brought down on the first trip of the *Roosevelt*, June 22, arriving at Seattle, July 7. They were at once forwarded by American Railway Express to Funsten Bros. & Co., St. Louis. The shipment consisted of 692 blues and 19 whites, secured as follows: St. George, 602 blue and 5 white; St. Paul, 90 blue and 14 white.

SALES OF FUR-SEAL SKINS.

In the calendar year 1918 two sales of dressed, dyed, and machined fur-seal skins were held at St. Louis, Mo., by Funsten Bros. & Co. The skins were disposed of at public auction to the highest bidders. The sales occurred on April 22 and October 7. The total number of skins sold was 8,100, and the total amount bid at the two sales was $375,385.

At the sale on April 22 the number of skins sold was 6,100, and the total price bid was $271,945. The maximum price received was $64, and the average per skin was $44.58, an advance of 30 per cent over the average of $33.17 per skin realized at the sale the previous October. The following table shows details in regard to the sale:

DETAILS OF SALE OF 6,100 DRESSED, DYED, AND MACHINED PRIBILOF ISLANDS FUR-SEAL SKINS AT ST. LOUIS, APR. 22, 1918.

Lot No.	Number of skins.	Trade classification.	Price per skin.	Total for lot.
1	65	15 wigs; 50 extra extra large	$64.00	$4,160.00
2	50	Extra extra large	57.00	2,850.00
3	50	do	58.00	2,900.00
4	50	do	56.00	2,800.00
5	50	do	57.00	2,850.00
6	50	do	56.00	2,800.00
7	50	Extra extra large; cut, scarred, etc	40.00	2,000.00
8	40	do	43.00	1,720.00
9	70	Extra large	51.00	3,570.00
10	70	do	51.00	3,570.00
11	70	do	54.00	3,780.00
12	70	do	56.00	3,920.00
13	70	do	56.00	3,920.00
14	70	do	53.00	3,710.00
15	70	do	57.00	3,990.00
16	70	do	57.00	3,990.00
17	70	do	54.00	3,780.00
18	70	do	56.00	3,920.00
19	70	do	53.00	3,710.00
20	60	do	54.00	3,240.00
21	50	Extra large; cut, scarred, etc	35.00	1,750.00
22	50	do	38.00	1,900.00
23	50	do	36.50	1,825.00
24	40	do	37.50	1,500.00
25	80	Large	48.00	3,840.00
26	80	do	50.00	4,000.00
27	80	do	50.00	4,000.00
28	80	do	51.00	4,080.00
29	80	do	51.00	4,080.00
30	80	do	53.00	4,240.00
31	80	do	54.50	4,360.00
32	80	do	53.00	4,240.00
33	80	do	53.00	4,240.00
34	80	do	52.00	4,160.00
35	80	do	53.00	4,240.00
36	80	do	52.00	4,160.00
37	80	do	54.50	4,360.00
38	80	do	52.00	4,160.00
39	80	do	53.00	4,240.00
40	80	do	52.00	4,160.00
41	80	do	53.00	4,240.00
42	80	do	52.00	4,160.00
43	80	Large; cut, scarred, etc	35.00	2,800.00
44	80	do	33.00	2,640.00
45	80	do	36.00	2,880.00
46	80	do	37.00	2,960.00
47	80	do	36.00	2,880.00
48	60	do	37.50	2,250.00
49	90	Mediums	43.00	3,870.00
50	90	do	40.50	3,645.00
51	90	do	40.50	3,645.00
52	90	do	39.00	3,510.00
53	90	do	41.50	3,735.00
54	90	do	41.00	3,690.00
55	90	do	39.00	3,510.00
56	90	do	40.00	3,600.00

DETAILS OF SALE OF 6,100 DRESSED, DYED, AND MACHINED PRIBILOF ISLANDS FUR-SEAL SKINS AT ST. LOUIS, APR. 22, 1918—Continued.

Lot No.	Number of skins.	Trade classification.	Price per skin.	Total for lot.
57	90	Mediums	41.00	3,690.00
58	90	do	41.00	3,690.00
59	90	do	43.00	3,870.00
60	90	do	40.00	3,600.00
61	90	do	43.50	3,915.00
62	90	do	45.50	4,095.00
63	90	do	45.00	4,050.00
64	90	do	43.00	3,870.00
65	90	do	44.50	4,005.00
66	90	do	44.50	4,005.00
67	90	Mediums; cut, scarred, etc	33.00	2,970.00
68	90	do	34.00	3,060.00
69	90	do	31.00	2,790.00
70	90	do	34.50	3,105.00
71	90	do	34.50	3,105.00
72	90	Small mediums	40.00	3,600.00
73	90	do	39.50	3,555.00
74	60	do	38.50	2,310.00
75	60	do	43.50	2,610.00
76	50	Small mediums; cut, scarred, etc	30.00	1,500.00
77	50	do	29.00	1,450.00
78	35	III. (1 wig; 7 extra extra large; 27 extra large)	35.50	1,242.50
79	35	III. (1 wig; 6 extra extra large; 28 extra large)	34.00	1,190.00
80	60	III. (24 large; 23 mediums; 13 small mediums)	28.00	1,680.00
81	60	III. (24 large; 23 mediums; 13 small mediums)	27.50	1,650.00
82	60	III. (26 large; 26 mediums; 8 small mediums)	26.50	1,590.00
83	55	IV. (1 extra extra large; 4 extra large; 10 large; 35 mediums; 5 small mediums)	18.50	1,017.50
Total	6,100			271,945.00

The following table gives a summary of the trade classification and the percentage of the total number in each class:

SUMMARY OF TRADE CLASSIFICATION AND PERCENTAGE IN EACH CLASS OF THE FUR-SEAL SKINS SOLD AT ST. LOUIS, APR. 22, 1918.

Trade classification.	Number in class.	Percentage.
Wigs	17	0.28
Extra extra large	404	6.62
Extra large	1,079	17.69
Large	1,984	32.54
Mediums	2,177	35.68
Small mediums	439	7.19
Total	6,100	100.00

At the sale on October 7, 1918, the number of skins sold was 2,000 and the total price bid was $103,440. The highest price received was $75, and the average per skin was $51.72, an increase of 16 per cent over the April sale. The following table shows details in regard to the sale:

DETAILS OF SALE OF 2,000 DRESSED, DYED, AND MACHINED PRIBILOF ISLANDS FUR-SEAL SKINS AT ST. LOUIS, OCT. 7, 1918.

Lot No.	Number of skins.	Trade classification.	Price per skin.	Total for lot.
1	30	Wigs	$75	$2,250
2	50	Extra extra large	57	2,850
3	50	do	57	2,850
4	50	do	57	2,850
5	50	do	56	2,800
6	30	do	71	2,130
7	50	Extra extra large; cut, scarred, etc	42	2,100
8	70	Extra large	53	3,710
9	70	do	52	3,640
10	70	do	52	3,640
11	70	do	60	4,200
12	70	do	62	4,340
13	40	do	64	2,560
14	35	Extra large; cut, scarred, etc	39	1,365
15	35	do	43	1,505
16	80	Large	51	4,080
17	80	do	51	4,080
18	80	do	52	4,160
19	80	do	55	4,400
20	80	do	60	4,800
21	80	do	61	4,880
22	80	do	61	4,880
23	40	do	58	2,320
24	50	Large; cut, scarred, etc	40	2,000
25	50	do	40	2,000
26	90	Mediums	48	4,320
27	90	do	47	4,230
28	90	do	47	4,230
29	90	do	46	4,140
30	50	Mediums; cut, scarred, etc	35	1,750
31	30	Small mediums	40	1,200
32	30	do	38	1,140
33	30	Small mediums; cut, scarred, etc	33	990
34	30	III. { 3 extra extra large; 12 large; 12 mediums; 3 small mediums }	35	1,050
Total	2,000			103,440

The following table gives a summary of the trade classification and the percentage of the total number in each class:

SUMMARY OF TRADE CLASSIFICATION AND PERCENTAGE IN EACH CLASS OF THE FUR-SEAL SKINS SOLD AT ST. LOUIS, OCT. 7, 1918.

Trade classification.	Number in class.	Percentage.
Wigs	30	1.50
Extra extra large	283	14.15
Extra large	460	23.00
Large	712	35.60
Mediums	422	21.10
Small mediums	93	4.65
Total	2,000	100.00

GRADES AND COMPARATIVE VALUES OF SEALSKINS.

It appears advisable to record the comparative trade classifications and values received for the various sizes of sealskins offered for sale at St. Louis, April 22 and October 7, 1918. The following table gives the number and grade of skins of each category, and the high, low, and average prices received:

COMPARATIVE VALUES BY GRADES AND SIZES OF SEALSKINS SOLD IN 1918.

Classes and sales.	Grade.	Number.	High.	Low.	Average.	Total.	Total number.	Average.	Total price.
Wigs:									
Apr. 22	I and II	15	$64.00	$64.00	$64.00	$960.00	17	$60.55	$1,029.50
	III	2	35.50	34.00	34.75	69.50			
Oct. 7	I and II	30	75.00	75.00	75.00	2,250.00	30	75.00	2,250.00
Extra extra large:									
Apr. 22	I and II	300	64.00	56.00	58.00	17,400.00	404	53.44	21,591.00
	Cut, etc	90	43.00	40.00	41.33	3,720.00			
	III	13	35.50	34.00	34.80	452.50			
	IV	1	18.50	18.50	18.50	18.50			
Oct. 7	I and II	230	71.00	56.00	58.60	13,480.00	283	55.42	15,685.00
	Cut, etc	50	42.00	42.00	42.00	2,100.00			
	III	3	35.00	35.00	35.00	105.00			
Extra large:									
Apr. 22	I and II	803	57.00	51.00	54.33	45,100.00	1,079	50.10	54,059.50
	Cut, etc	190	38.00	35.00	36.71	6,975.00			
	III	55	35.50	34.00	34.73	1,910.50			
	IV	4	18.50	18.50	18.50	74.00			
Oct. 7	I and II	390	64.00	52.00	56.64	22,090.00	460	54.26	24,960.00
	Cut, etc	70	43.00	39.00	41.00	2,870.00			
Large:									
Apr. 22	I and II	1,440	54.50	48.00	52.05	74,960.00	1,984	47.16	93,576.00
	Cut, etc	460	37.50	33.00	35.67	16,410.00			
	III	74	28.00	26.50	27.31	2,021.00			
	IV	10	18.50	18.50	18.50	185.00			
Oct. 7	I and II	600	61.00	51.00	56.00	33,600.00	712	53.39	38,020.00
	Cut, etc	100	40.00	40.00	40.00	4,000.00			
	III	12	35.00	35.00	35.00	420.00			
Mediums:									
Apr. 22	I and II	1,620	45.50	39.00	41.97	67,995.00	2,177	39.33	85,638.00
	Cut, etc	450	34.50	31.00	33.40	15,030.00			
	III	72	28.00	26.50	27.29	1,965.50			
	IV	35	18.50	18.50	18.50	647.50			
Oct. 7	I and II	360	48.00	46.00	47.00	16,920.00	422	45.23	19,090.00
	Cut, etc	50	35.00	35.00	35.00	1,750.00			
	III	12	35.00	35.00	35.00	420.00			
Small mediums:									
Apr. 22	I and II	300	43.00	38.50	39.91	12,075.00	439	36.10	16,051.00
	Cut, etc	100	30.00	29.00	29.50	2,950.00			
	III	34	28.00	26.50	27.45	933.50			
	IV	5	18.50	18.50	18.50	92.50			
Oct. 7	I and II	60	40.00	38.00	39.00	2,340.00	93	36.93	3,435.00
	Cut, etc	30	33.00	33.00	33.00	990.00			
	III	3	35.00	35.00	35.00	105.00			
Apr. 22							6,100	44.58	271,945.00
Oct. 7							2,000	51.72	103,440.00
Both sales							8,100	46.34	375,385.00

RECAPITULATION OF SALES OF FUR-SEAL SKINS IN 1918.

	Apr. 22, 1918.		Oct. 7, 1918.		Total.	
	Number.	Amount.	Number.	Amount.	Number.	Amount.
Wigs	17	$1,029.50	30	$2,250.00	47	$3,279.50
Extra extra large	404	21,591.00	283	15,685.00	687	37,276.00
Extra large	1,079	54,059.50	460	24,960.00	1,539	79,019.50
Large	1,984	93,576.00	712	38,020.00	2,696	131,596.00
Mediums	2,177	85,638.00	422	19,090.00	2,599	104,728.00
Small mediums	439	16,051.00	93	3,435.00	532	19,486.00
Total	6,100	271,945.00	2,000	103,440.00	8,100	375,385.00

FUR-SEAL SKINS ON HAND DECEMBER 31, 1918.

The 1917 report of Alaska Fisheries and Fur Industries, page 95, gives the number of fur-seal skins on hand in the States on December 31, 1917, as 9,600. Of these, 12 skins were in storage in Washington, D. C., thus making the apparent number on hand at St. Louis, 9,588. There was, however, a discrepancy of 2 skins in the shipment from St. George Island in 1914, which should be deducted from the latter number, thus leaving a total of 9,586 on hand at St. Louis as of December 31, 1918. Slight discrepancies sometimes occur between the count on the islands and the final count at St. Louis. The following table shows the receipt of shipments and the sales of skins by Funsten Bros. & Co. during the calendar year 1918:

FUR-SEAL SKINS AT ST. LOUIS IN 1918.

On hand, St. Louis, Jan. 1, 1918		9,586
Shipments received in 1918:		
February	4,258	
July	3,542	
October	17,816	
November	1,978	27,594
Total		37,180
Sales during 1918:		
April 22	6,100	
October 7	2,000	8,100
Balance on hand Dec. 31, 1918		29,080

The above number remaining on hand is the same as reported by Funsten Bros. & Co. under date of January 8, 1919. There were, in addition to the above, 7,483 skins en route from the Pribilof Islands at the end of the year. They reached St. Louis January 29, 1919.

SALE OF FOX SKINS.

The take of fox skins during the season of 1917–18 was given on pages 88–89 of the 1917 Alaska report as 90 blue and 14 white for St. Paul Island, and 602 blue and 5 white for St. George Island. These skins were shipped from the Islands on the *Roosevelt* June 22, and were sold in St. Louis at public auction on October 7, 1918. The 692 blue foxes brought $57,099.50, an average of $82.51 each. This was an advance of 35 per cent over the prices received for the 1916–17 skins at the sale in October, 1917. The 19 white-fox skins brought $1,080, or $48 to $60 each.

DETAILS OF SALE OF 692 BLUE-FOX SKINS AND 19 WHITE-FOX SKINS FROM PRIBILOF ISLANDS AT ST. LOUIS, OCT. 7, 1918.

Lot No.	Number of skins.	Trade classification.	Price per skin.	Total for lot.
Blue-fox skins:				
120	4	Fine dark	$116.00	$464.00
121	6	do	136.00	816.00
122	10	I dark	113.00	1,130.00
123	10	do	96.00	960.00
124	8	do	93.00	744.00
125	8	do	91.00	728.00
126	6	II extra large dark	93.00	558.00
127	6	II dark	86.00	516.00
128	6	do	85.00	510.00
129	12	do	88.00	1,056.00
130	12	do	86.00	1,032.00
131	12	do	82.00	984.00
132	8	II extra large low dark	76.00	608.00
133	10	II low dark	65.00	650.00
134	9	do	62.00	558.00
135	4	I extra large blue	116.00	464.00
136	5	do	95.00	475.00
137	10	I blue	94.00	940.00
138	10	do	80.00	800.00
139	10	do	92.50	925.00
140	12	II blue	80.00	960.00
141	16	do	70.00	1,120.00
142	12	do	69.00	828.00
143	12	II low blue	73.00	876.00
144	13	II low	61.00	793.00
145	14	do	53.00	742.00
146	10	I silvery	104.00	1,040.00
147	13	II pale	63.00	819.00
148	21	III dark	45.00	945.00
149	20	III blue	47.00	940.00
150	4	Extra fine dark	200.00	800.00
151	8	I extra large fine dark	165.00	1,320.00
152	5	Fine dark	175.00	875.00
153	5	do	150.00	750.00
154	5	II extra large dark	125.00	625.00
155	6	Fine dark	140.00	840.00
156	7	II dark	88.00	616.00
157	10	Fine blue	130.00	1,300.00
158	8	I blue	100.00	800.00
159	12	II blue	88.00	1,056.00
160	5	II low blue	76.00	380.00
161	5	I extra large blue	120.00	600.00
162	4	Fine dark	175.00	700.00
163	4	I extra large dark	170.00	680.00
164	10	I dark	160.00	1,600.00
165	10	do	140.00	1,400.00
166	8	II extra large dark	94.00	752.00
167	8	II dark	92.00	736.00
168	6	do	88.00	528.00
169	12	do	84.00	1,008.00
170	12	do	87.00	1,044.00
171	8	II extra large low dark	68.00	544.00
172	4	I extra large blue	105.00	420.00
173	4	do	105.00	420.00
174	10	I blue	95.00	950.00
175	10	do	97.00	970.00
176	6	do	80.00	480.00
177	8	II extra large blue	90.00	720.00
178	12	II blue	88.00	1,056.00
179	14	do	86.00	1,204.00
180	14	do	84.00	1,176.00
181	12	do	84.00	1,008.00
182	12	do	70.00	840.00
183	12	II low blue	73.00	876.00
184	12	do	69.00	828.00
185	14	II low	60.00	840.00
186	9	II low dark	74.00	666.00
187	14	I and II pale	58.00	812.00
188	18	III	35.00	630.00
189	21	IV	11.00	231.00
190	15	V	2.50	37.50
White-fox skins:				
191	14	I and II extra large	60.00	840.00
192	5	I and II white fox	48.00	240.00
Total	711			58,179.50

FUR-SEAL CENSUS, PRIBILOF ISLANDS, 1918.

By G. Dallas Hanna.

SCOPE OF 1918 CENSUS.

The census of the fur-seal herd resorting to the Pribilof Islands in 1918 was taken in the usual manner. It is gratifying to note that a continued increase is shown. The important element of the herd, the breeding cows, began to gain immediately upon the cessation of pelagic sealing in 1911. The influence of this has probably ceased to exist by this time and the herd appears to have settled upon a normal annual rate of increase of about 10 per cent. The actual average for seven years has been 9.78 per cent.

Information procured by Agents Fassett and Proctor in seal killings has been freely used in the census computations. Those actually assisting in the rookery counts were C. E. Crompton and the late A. C. Reynolds. The Bureau was deprived of the important assistance in field work of Dr. Harold Heath through an unfortunate accident in which he was severely injured. A cliff caved away as he was passing along Tolstoi Point and in the fall upon the rocks below he suffered fractures of both legs and of several face bones.

The Coast Guard cutter *Unalga* furnished transportation between the islands at the proper times for census work.

The plan of the 1917 census was followed closely. Harems were counted on all rookeries at the height of the breeding season and enough pups were counted later to ascertain the average harem. With this as a basis, the total number of pups was computed and also the remainder of the information so necessary to a thorough understanding of the subject was derived. Little could be accomplished in way of area computations.

Commercial killing in 1918 furnished an opportunity to test the estimates of bachelors of previous years. The quota taken was larger than in any year since 1889, and it was the general opinion of all concerned on the islands that the figures for each age which had been computed in advance were conservative. Age determination of all seals killed, by measurement of the carcass, has made it possible to not only keep the reserve required by law, but also to state with a reasonable degree of accuracy the number of any one class remaining for killing in subsequent years. The estimates are believed to be under rather than over the actual number of each class in existence.

PUPS.

Pup counting began just as soon as it was possible to enter the rookeries with reasonable safety to human life and continued until the number which was swimming made the figures obtainable subject to too great an error to warrant further work. The same field methods were used as in former years. As in 1917 those rookeries were selected for counting which were known from past records and observations on the ground to be representative of the herd. The average harem thus ascertained proved to be almost exactly the same as that which was found in 1917, and it appears from all avail-

able information that this is about as low as it can go. As long as the percentage of nonbreeding bulls to breeding bulls remains as high as it has been in these two years there is no probability that the average harem will materially change for the herd.

There is a general stability or sameness developing on the rookeries due to the excess of bulls, and the deviation of the average harem on certain rookeries from the general average seems now to be due largely to topography of the breeding areas. This is indicated by the similarity of the average harems on rookeries counted the past two seasons.

Since pups could not be counted on all rookeries, the average harem had to be computed for many of them. On account of the closeness of the 1917 and 1918 figures on those areas counted it was placed at the same as the 1917 figure in most cases. The only exceptions to this rule were in those cases in which field observations were convincing proof that the 1917 condition was abnormal and had disappeared.

Since so many factors relating to the pups are directly dependent upon the average harem, this has formed the basis of most of the computations found in the following tables. Thus it is well known that the percentage of dead pups on a given rookery is dependent on the topography of the rookeries, the number of harem bulls, and the average harem. With these factors constant, the percentage must be constant when pelagic sealing is nonexistent and no epidemic occurs, no evidence of either of which was observed in 1918. Therefore it seems justifiable to place the percentage of dead on rookeries not actually counted at the same as was carefully computed for 1917. This brings it to 3 per cent for the herd.

DISTRIBUTION OF PUPS IN 1918.

Rookery.	Date of counts.	Living pups.	Dead pups.	Total pups.	Percentage dead.
ST. PAUL ISLAND.					
Kitovi		2,502	38	[a] 2,540	1.49
Lukanin		2,174	61	[a] 2,235	2.72
Gorbatch		9,154	332	[a] 9,486	3.49
Ardiguen		778	14	[a] 792	1.76
Reef	Aug. 9–10	18,890	508	19,398	2.61
Sivutch		6,167	158	[a] 6,325	2.49
Lagoon	Aug. 7	493	19	512	3.71
Tolstoi		16,349	376	[a] 16,725	2.24
Zapadni		11,156	304	[a] 11,460	2.65
Little Zapadni		8,795	294	[a] 9,089	3.23
Zapadni Reef	Aug. 8	517	19	536	3.54
Polovina	Aug. 12	5,191	152	5,343	2.84
Polovina Cliffs		1,824	58	[a] 1,882	3.08
Little Polovina		1,473	18	[a] 1,491	1.20
Morjovi		3,224	111	[a] 3,335	3.32
Vostochni		30,057	1,411	[a] 31,468	4.48
Total		118,744	3,873	122,617	3.15
ST. GEORGE ISLAND.					
North		6,837	174	[a] 7,011	2.48
Staraya Artil		5,332	108	[a] 5,440	1.98
Zapadni	Aug. 14	796	10	806	1.24
South	do	61	.....	61	.....
East Reef	Aug. 15	2,092	28	2,120	1.31
East Cliffs		4,751	109	[a] 4,860	2.24
Total		19,869	429	20,298	2.11
Total, both islands		138,613	4,302	142,915	3.01

[a] Based on estimated average harem.

The percentage of increase in the number of pups on a given rookery is dependent upon the choosing of a landing place by the cows. Accordingly great variations in the percentage of gain on individual rookeries have been recorded during the past few years. Thus in 1918 one rookery on which a count was made gained 154 per cent, while another lost 3 per cent. There is no adequate explanation available for these conditions. The gains for the entire herd, however, seem to be following closely an autocatylitic curve, as was pointed out by Prof. G. H. Parker.[a] During the past six years the percentages of increase have been 12.54, 1.06, 11.02, 12.99, 9.44, and 11.63, with an average of 9.78 since 1912. For a rough calculation into the future it may be placed at 10 per cent, and taking into consideration the conservative errors of the census it may actually exceed this figure through a period of years.

PERCENTAGE OF INCREASE OR DECREASE IN THE NUMBER OF PUPS IN 1918 FROM 1917.

Rookery.	Total pups, 1917.	Total pups, 1918.	Percentage of increase (+) or decrease (−).
ST. PAUL ISLAND.			
Kitovi	2,520	2,540	+ 0.79
Lukanin	2,235	2,235	.....
Gorbatch	8,649	9,486	+ 9.67
Ardiguen	726	792	+ 9.09
Reef	17,442	19,398	+ 11.21
Sivutch	5,060	6,325	+ 25.00
Lagoon	466	512	+ 9.87
Tolstoi	15,433	16,725	+ 8.37
Zapadni	9,828	11,460	+ 16.60
Little Zapadni	6,863	9,089	+ 32.43
Zapadni Reef	358	536	+ 49.72
Polovina	4,918	5,343	+ 8.64
Polovina Cliffs	1,761	1,882	+ 6.87
Little Polovina	1,260	1,491	+ 18.33
Morjovi	2,921	3,335	+ 14.17
Vostochni	28,249	31,468	+ 11.39
Total	108,689	122,617	+ 12.81
ST. GEORGE ISLAND.			
North	6,783	7,011	+ 3.36
Staraya Artil	5,642	5,440	− 3.58
Zapadni	1,050	806	− 2.32
South	24	61	+154.16
East Reef	1,786	2,120	+ 13.70
East Cliffs	4,050	4,860	+ 20.00
Total	19,335	20,298	+ 4.98
Total, both islands	128,024	142,915	+ 11.63

BREEDING COWS.

By inference the number of breeding cows is the same as the number of pups, 142,915. This is a very creditable increase of 14,891, or 11.63 per cent from 1917. The increase showed very materially on the rookeries. Many of the avenues left for ingress and egress to the hauling grounds have closed up or are fast closing. Small outlying breeding masses of seals are being joined to larger masses and there is a general expansion rearward. The season was marked by the establishment of very few new breeding sections.

[a] Proceedings, National Academy of Science, vol. 4, p. 169.

A FUR-SEAL HAREM.

FUR SEALS, FEMALES AND PUPS.

Some, which in 1917 promised to develop, were abandoned. For instance, the lone bull failed to return to Otter Island to try to establish a harem, and no cows returned to Suthetunga, otherwise known as Zapadni Point. There seemed to be a tendency everywhere toward crowding in the larger areas, but the records do not bear this out. The phenomenal growth of 154 per cent on South Rookery is a feature of interest. Especially is this true in the light of conditions on Zapadni (St. George) about half a mile distant. For some unaccountable reason this rookery fails to develop.

CHARTS OF BREEDING AREAS.

Unfortunately it was not possible to test the area method of computation of seals on the breeding grounds of St. Paul Island again this year. Charts were carefully made on St. George, however, by Mr. A. C. Reynolds, and his areas have been determined as follows by means of a polar planimeter:

AREAS OF ST. GEORGE ROOKERIES.

Rookery.	Square feet.	Rookery.	Square feet.
North	102,000	East Reef	35,600
Staraya Artil	65,200	East Cliffs	35,200
Zapadni	17,200		

No chart of South Rookery was made, because it has been established since the Coast and Geodetic Survey completed its work. In other cases their charts were taken in the field and the plotting carefully done there.

LOSS OF COWS ON ISLANDS.

On four rookeries of St. Paul Island 29 dead cows were found during the counting of 19,398 pups. This proportion applied to the entire herd would give 213 as the total dead. This number is to be compared with 39 for 1916 and 129 for 1917. The increase in the percentage of loss of cows on the rookeries is larger than the normal percentage of increase of this class, due solely to the great surplus of males which has developed in recent years. If the progeny of these lost cows is ascertained for 20 or more years ahead, it will be found that the herd is suffering a very perceptible injury. It can only be avoided by reducing the number of breeding and fighting bulls, which will result in an increase in the average harem.

In 1918 the agents have kept very accurate records of the loss of cows during commercial killing. It has always been known that an occasional cow will go on the bachelor's hauling grounds and may even give birth to her pup there. Should she be young, it is almost impossible to distinguish her from the 3-year-old males without capturing her and making an anatomical examination. This is impracticable industrially. Occasionally a cow in the drive will be hit with a club unavoidably, even though she be recognized. The total number killed in the most extensive work since 1889 was St.

Paul 23 and St. George 12. It was customary in commercial sealing throughout the leases 1871 to 1909 to close operations at the end of July, because the rigid discipline of the harem masters is then relaxed and cows wander in increased numbers to the hauling grounds. The danger of killing them after that date is greater than before.

HERMAPHRODITE SEALS.

In the 1918 killings two hermaphrodite seals were found on St. Paul Island. Both were too small to have begun the development of the outward appearance of the bull and were supposed to be 3-year-old males by the clubbers. The skull of one which was studied had the characteristics of both sexes while the only generative organs present were ovaries.

THE 3-YEAR-OLD COWS.

Since 1915 the loss of seals during the first three years has been placed at 50 per cent. The result arrived at in 1918 is further evidence that this rate of loss is approximately correct.

In 1917 there were estimated 128,024 breeding cows. By deducting 10 per cent or 12,802 which have been lost due to old age there remain 115,222 of the 1917 herd in 1918. This figure deducted from the total number calculated for 1918 (142,915) leaves 27,693 to represent the increment of 3-year-old cows in this year.

To get at the actual number of this class it is necessary to go back to 1915, when a complete pup count was made showing 103,527. If half of these were males and half females and all had lived, there would be 51,763 new cows in 1918. If half died, however, there would only be 25,881, a number so close to that calculated above, 27,693, as to be significant. The difference would be easily accounted for in many ways, such as an annual variation of losses, inexact equality of births of sexes, etc.

AVERAGE HAREMS ON ROOKERIES COUNTED IN 1918.

Rookery.	Breeding cows.	Harem bulls.	Average harem.
ST. PAUL ISLAND.			
Reef	19,398	688	28.19
Lagoon	512	25	20.48
Zapadni Reef	536	27	19.85
Polovina	5,343	185	28.88
Total	25,789	925	27.88
ST. GEORGE ISLAND.			
Zapadni	806	43	18.74
South	61	8	7.62
East Reef	2,120	99	21.41
Total	2,987	150	19.91
Total, both islands	28,776	1,075	26.76

THE AVERAGE HAREM IN 1918 FOR ALL ROOKERIES.

Rookery.	Breeding cows.	Harem bulls.	Average harem.
ST. PAUL ISLAND.			
Kitovi	2,540	127	a 20.00
Lukanin	2,235	100	a 22.35
Gorbatch	9,486	306	a 31.00
Ardiguen	792	36	a 22.00
Reef	19,398	688	28.19
Sivutch	6,325	230	a 27.50
Lagoon	512	25	20.48
Tolstoi	16,725	625	a 26.76
Zapadni	11,460	494	a 23.19
Little Zapadni	9,089	343	a 26.49
Zapadni Reef	536	27	19.85
Polovina	5,343	185	28.88
Polovina Cliffs	1,882	93	a 20.23
Little Polovina	1,491	52	a 28.67
Morjovi	3,335	145	a 23.00
Vostochni	31,468	1,134	a 27.74
Total	122,617	4,610	26.59
ST. GEORGE ISLAND.			
North	7,011	262	a 26.75
Staraya Artil	5,440	160	a 34.00
Zapadni	806	43	18.74
South	61	8	7.62
East Reef	2,120	99	21.41
East Cliffs	4,860	162	a30.00
Total	20,298	734	27.65
Total, both islands	142,915	5,344	26.74

a Estimate.

AGES OF COWS.

The maximum age which the female seal attains is not known at present, but this continues to be one of the most important unsolved problems in connection with the herd. No opportunity to gather information upon the subject has been overlooked.

Branding of female pups was first undertaken in 1896 by the Jordan Commission. It had as its object in those days the making of the skins of the female seals of such small value that it would not be profitable for pelagic sealers to continue in business. It was believed at first that the results to be obtained were of sufficient value to warrant the continuation of the process for a considerable period of years; accordingly instructions were issued, and the branding continued up to and including the season of 1902. The derival of important biological information from these branded animals seemed to be an overlooked possibility. As a measure of protection to the female seals it was a failure.

In 1896, 377 pups were branded; 124 of these had three bars across the back and one down the center, 191 had a single bar across the back, and 62 had this and three bars across the back. In 1897, 847 were branded: with three bars across the back, 1,033 had two bars, and 5,498 had one bar. Thereafter the single bar was used entirely, with the exception of 1898, when 300 were branded with a diagonal bar across the back. The total number branded during any of the years after 1897 can not be given, because the figures for St. George Island are lacking, but from 1898 to 1902 the numbers branded on St. Paul Island were secured from the island log.

FEMALE PUPS BRANDED, 1896 TO 1902.

Year.	Number.	Year.	Number.
1896	[a] 377	1901	[b] 4,173
1897	[a] 7,369	1902	[b] 1,416
1898	[b] 2,363		
1899	[b] 2,191	Total	19,587
1900	[b] 1,698		

[a] Including St. George Island. [b] St. Paul Island only.

These branded animals have returned to the rookeries each succeeding season up to and including 1918, but since the single bar brand was used in many successive years we are not safe in assuming that any branded animal bearing this brand was born before 1902. This would make the unquestionable age of branded cows seen in 1918, 16 years. Since the cow brings forth her first young when 3 years old, this would give her 15 breeding years at least. Thus the assumption of a normal old-age death rate of the female of 10 per cent per year seems to be if anything too large.

In 1918 there were observed by Mr. Reynolds, Mr. Crompton, and myself six of these brands which may be known as the 1902 series, three on St. Paul and three on St. George. Two of these had nursing pups. When it is considered that these branded animals passed through nine years of relentless pelagic sealing, this is not an insignificant number by any means.

There is little to record regarding the 1912 series of branded cows. They were observed on many rookeries and seemed to be normal in every respect.

BREEDING BULLS.

The count of bulls actually in charge of harems was made complete at the usual time—the height of the breeding season. It continues to be the most important of all census work, and great care has been taken to make it as accurate as possible. The count is attended with considerable danger to human life when the rookeries are as large as in 1918. In order to get a vantage point from which beach-line harems can be seen and counted, it is often necessary to run the cordon of idle bulls. A misstep or a fall would likely prove fatal. In other places it is necessary to set up a long ladder in order to get a view of distant bulls which could not possibly be seen from the ground. This ladder must be held by natives, and when a high wind is blowing there is considerable danger of it overturning. A fall to the jagged rocks below would be serious. Plans are being considered for a platform walkway for one of the St. George rookeries, and if it proves a success here the same will probably be installed on St. Paul. In some cases when the weather is suitable certain rookeries can be counted more accurately from a boat than from the land. In this way good counts were obtained on Lagoon, Tolstoi, the three Zapadnis, and Sivutch on St. Paul and on Staraya Artil and the two East rookeries on St. George.

The number of breeding bulls is obviously greatly in excess of the actual requirements on the rookeries. In addition to these there is a large reserve of idle and surplus bulls.

Facts obtained in 1918 from the 1912 branded males are of the greatest significance in showing where this excess came from. The 1912 seals were 6 years old this year. The supposition has generally prevailed in the past that males of this age were fully grown and able to hold harems or at least skirt the rookeries as idle bulls. But this is not true. The 6-year-old male is hardly half grown and resorts to the hauling grounds or elsewhere. He is not physically able to get anywhere near the breeding cows.

These 6-year-olds were born the year the closed season became effective. Commercial killing was not done in 1912. So where does this great excess of full-grown males come from which has been found in 1916, 1917, and 1918? Obviously it can not be from the 6-year-olds. Likewise it can not wholly be from those animals which were born in 1910 and 1911, because they were only 6 years old in 1916 and 1917, respectively, when there was a surplus. Therefore the closed season of 1912–1917 has not yet become effective upon the breeding grounds, and the surplus found in 1916 and 1917 and in large part in 1918 comes from those reserves spared from the killings of 1908 to 1911. The reserves then made for breeding purposes were too large rather than too small. They provided the herd with so many bulls that the death rate of both pups and cows on land is far above what it should be.

IDLE BULLS.

Idle bulls were counted at the same time as the harems, and as the rookeries exist to-day this is a difficult task. There are so many nonbreeding males about the rookeries that some plan had to be followed in segregating the idle bulls and that class variously known as quitters, young bulls, and half bulls. It has been learned that about three tiers of males just outside of the harems are stationary and hold their positions tenaciously. They are found spaced about as the harem bulls. Out beyond these there are more bulls, however, which wander here and there endeavoring to find a place where they can get in close to the harems. The plan followed the past two years has been to classify those holding positions as idle bulls and all others as surplus bulls. This is a distinction which in some cases is hard to decide upon and the classes intergrade. However, it does not seem practicable to call all males about the rookery, not actually in possession of cows, idle bulls. This might be done to obtain a figure for the total available reserve males except for the fact that not half of them are about the rookery. Large numbers give up hope of holding harems and go to the hauling grounds and to sea to cruise about the rookery margins. These must be estimated. Therefore the plan adopted seems best to follow.

The harem count gave the following results:

HAREM AND IDLE BULLS IN 1918.

Rookery.	Date.	Harem bulls.	Idle bulls.	Total.
ST. PAUL ISLAND.				
Kitovi	July 16	127	82	219
Lukanin	do	100	49	149
Gorbatch	do	306	137	443
Ardiguen	do	36	13	49
Reef	do	688	307	995
Sivutch	July 19	230	90	320
Lagoon	July 18	25	18	43
Tolstoi	do	625	312	937
Zapadni	do	494	193	687
Little Zapadni	do	343	199	542
Zapadni Reef	do	27	8	35
Suthetunga	do			
Polovina	do	185	131	316
Polovina Cliffs	do	93	59	152
Little Polovina	do	52	23	75
Morjovi	July 17	145	94	239
Vostochni	do	1,134	530	1,664
Total		4,610	2,245	6,855
ST. GEORGE ISLAND.				
North	July 22	262	64	326
Staraya Artil	July 23	160	40	200
Zapadni	July 22	43	20	63
South	do	8	8	16
East Reef	July 23	99	45	144
East Cliffs	do	162	22	184
Total		734	199	933
Total, both islands		5,344	2,444	7,788

PERCENTAGE OF IDLE BULLS TO HAREM BULLS COMPARED TO THE AVERAGE HAREM IN 1918.

Rookery.	Percentage idle bulls to harem bulls.	Average harem.
ST. PAUL ISLAND.		
Kitovi	65.35	20.00
Lukanin	49.00	22.35
Gorbatch	44.77	31.00
Ardiguen	36.11	22.00
Reef	44.62	28.19
Sivutch	39.13	27.50
Lagoon	72.00	20.48
Tolstoi	49.92	26.76
Zapadni	39.06	23.19
Little Zapadni	58.01	26.49
Zapadni Reef	29.62	19.85
Polovina	70.81	28.88
Polovina Cliffs	63.44	20.23
Little Polovina	44.23	28.67
Morjovi	64.82	23.00
Vostochni	46.73	27.74
Total	48.72	26.59
ST. GEORGE ISLAND.		
North	24.42	26.75
Staraya Artil	25.00	34.00
Zapadni	46.51	18.74
South	100.00	7.62
East Reef	45.45	21.41
East Cliffs	13.58	30.00
Total	27.11	27.65
Total, both islands	45.75	26.74

SURPLUS BULLS.

No count of bachelors on the hauling grounds was made at the height of the season because of the interference this would have caused in the killings then taking place. In its stead the surplus bulls were counted about the back of the rookeries. This class includes those males found here and likewise those which are on the hauling grounds and elsewhere; obviously, the last must be estimated. No counts of them are possible. A count about the rookeries, however, is valuable because in a way it shows a breeding reserve which is unquestionably known to be in existence. For this purpose they might be added to the idle bulls but would tend to give an erroneous impression, because the count only represents a very small fraction of the number in actual existence. If those counted were added to the number of idle bulls they would make 2,444+3,951, or 6,395 nonbreeding males found about the rookeries at the time of the 1918 height of season harem count. This makes the percentage of idle and surplus bulls to harem bulls 119.66. From this it is apparent why the average harem was at or very near a minimum.

SURPLUS BULLS COUNTED IN 1918.

Rookery.	Surplus bulls.	Rookery.	Surplus bulls.
ST. PAUL ISLAND.		ST. GEORGE ISLAND.	
Kitovi	60	North	91
Lukanin	56	Staraya Artil	56
Gorbatch	168	Zapadni	29
Reef	595	South	4
Sivutch	250	East Reef	37
Tolstoi	267		
Suthetunga	93	Total	217
Zapadni	500		
Little Zapadni	54	Total, both islands	3,951
Polovina	194		
Little Polovina	80		
Morjovi	157		
Vostochni	1,260		
Total	3,734		

GAINS OF BULLS.

The great significant fact standing out in the census work of 1918 is the percentage of gain of harem bulls. This was 10.18 for the entire herd, a figure differing but slightly from the increase of the cows. Since there was an overabundance of idle and surplus bulls, it seems to show conclusively that the average harem in these two years was at its minimum. The average increase of harem bulls the five preceding years was 36.68 per cent. The increase or decrease of idle bulls means but little at this time. The difficulties of determining the actual number in this class as distinct from surplus bulls are almost insurmountable. Those animals at the rear of the rookery which might properly be called idle bulls either merge into the hauling grounds on one side occupied solely by surplus bulls and bachelors, or on the other side into the group properly known as idle bulls. It would not be right to call all bulls on the hauling grounds "idle bulls." Neither could the figure obtained from counting surplus bulls on the back of a rookery be considered to represent all the animals in this group. The great difficulty lies in the fact that in a large number of cases there is no line of demarcation between a rookery and a hauling ground. The rearward extension of the breeding seals is bordered by a sharp line, but the other classes are not.

At present there is no perfectly adequate means of classifying the nonbreeding bulls, and the plan adopted must be continued in spite of any faults it may possess.

COMPARISON OF HAREM AND IDLE BULLS IN 1918 WITH 1917.

Rookery.	Harem bulls.			Idle bulls.			Total.		
	1917.	1918.	Gain or loss.	1917.	1918.	Gain or loss.	1917.	1918.	Gain or loss.
ST. PAUL ISLAND.			*Per cent.*			*Per cent.*			*Per cent.*
Kitovi	126	127	+ 0.79	56	82	+ 46.42	182	209	+ 9.34
Lukanin	100	100		54	49	− 9.25	154	149	− 3.24
Gorbatch	279	306	+ 9.67	130	137	+ 5.38	409	443	+ 8.31
Ardiguen	33	36	+ 9.09	28	13	− 53.57	61	49	−19.67
Reef	613	688	+12.23	237	307	+ 29.53	850	995	+17.05
Sivutch	184	230	+25.00	72	90	+ 25.00	256	320	+25.00
Otter Island				1			1		
Lagoon	24	25	+ 4.16	15	18	+ 20.00	39	43	+10.25
Tolstoi	671	625	− 6.85	180	312	+ 73.33	851	937	+10.10
Suthetunga	2			64			66		
Zapadni	420	494	+17.61	342	193	− 43.56	762	687	− 9.84
Little Zapadni	259	343	+32.43	70	199	+184.28	329	542	+64.74
Zapadni Reef	22	27	+22.72	13	8	− 38.46	35	35	
Polovina	166	185	+11.44	130	131	+ .76	296	316	+ 6.75
Polovina Cliffs	87	93	+ 6.89	31	59	+ 90.32	118	152	+28.81
Little Polovina	35	52	+48.57	51	23	− 54.90	86	75	−12.79
Morjovi	127	145	+14.17	83	94	+ 13.25	210	239	+13.80
Vostochni	1,018	1,134	+11.39	784	530	− 32.39	1,802	1,664	− 7.65
Total	4,166	4,610	+10.65	2,341	2,245	− 4.10	6,507	6,855	+ 5.34
ST. GEORGE ISLAND.									
North	266	262	− 1.50	114	64	− 43.85	380	326	−14.21
Staraya Artil	163	160	− 1.84	113	40	− 64.60	276	200	−27.53
Zapadni	33	43	+30.30	17	20	+ 17.64	50	63	+26.00
South	6	8	+33.33	6	8	+ 33.33	12	16	+33.33
East Reef	81	99	+22.22	54	45	− 16.66	135	144	+ 6.66
East Cliffs	135	162	+20.00	61	22	− 63.93	196	184	− 6.12
Total	684	734	+ 7.30	365	199	− 45.47	1,049	933	−11.05
Total, both islands	4,850	5,344	+10.18	2,706	2,444	− 9.68	7,556	7,788	+ 2.99

AGES OF BULLS.

The age at which a male fur seal is full grown and the old-age limit are very important problems which are as yet only partially solved. It is known definitely that the breeding age is not reached in six years. And if the size at this age is any indication of the period of adolescence, full growth may not be reached until about the tenth year. This remains to be determined in the future from branded animals.

The maximum age is not certainly known, but has been estimated at from 15 to 20 years. The number of breeding years, however, is known positively to be as many as five, but not certainly any more. Probably the period is shorter when a large number of bulls makes incessant fighting a necessity than when they are few and lead a comparatively quiet existence.

The minimum breeding limit of five years has been assumed in 1918 on account of new information which has been obtained. Accordingly, 20 per cent has been deducted for annual old-age loss to the classes of bulls.

YEARLINGS.

Permission was asked for and granted on August 7 for the killing of 10 yearling males in order to be able to add to the meager stock of knowledge of this class. Owing to their rarity on the hauling grounds at that time of year, great difficulty was encountered in

finding the desired number. A drive from Zapadni August 8 yielded 4. On August 9 and 10 none was found on Polovina, Lukanin, Kitovi, Tolstoi, or Reef. Two more were secured on Zapadni on the latter date, making 6 altogether. Subsequent examination of the skulls of 4 more, thought to be yearlings when killed, proved them to be 2-year-olds. This study of the skulls has not as yet been completed, but is expected to yield valuable data on the growth of fur seals.

The information secured from the 6 undoubted yearlings follows:

DATA ON YEARLING SEALSKINS.

Tag No.	Date.	Carcass weight.		Length.	Skin weight.	
		Lbs.	*Oz.*	*Inches.*	*Lbs.*	*Oz.*
A 6483	Aug. 8	30	6	35.25	4	12
A 6485	do	28		35.00	4	5
A 6486	do	30	6	35.50	4	
A 6487	do	32	12	36.00	4	14
A 6489	Aug. 10	30	14	34.25	Not taken.	
A 6491	do	33	10	34.25	Do.	

ADOLESCENT SEALS.

The numbers of animals estimated for each age class is taken up in the statement of complete census following. These are found from the counts and estimates of 1917 by deducting 35 per cent for natural mortality the first year, 20 per cent the second, and 4 per cent the third. Also all animals killed for their skins have been deducted from their proper classes. This includes all killings from August 11, 1917, to August 10, 1918, the sealing year. The totals represent those supposed to be alive on the latter date.

COMPLETE CENSUS OF FUR SEALS AS OF AUGUST 10, 1918.

Pups, counted and estimated		142,915
Breeding cows, 3 years old and over, by inference		142,915
Harem bulls, counted		5,344
Idle bulls, counted		2,444
Yearlings, male and female, estimated:		
Pups born in 1917	128,024	
35 per cent deducted for natural mortality	44,808	
Yearlings, both sexes, beginning 1918	83,216	
Females, 50 per cent	41,608	
		41,608
Males beginning of 1918	41,608	
Males killed in 1918	13	
Males Aug. 10, 1918		41,595
2-year-olds, male and female, estimated:		
Yearling females Aug. 10, 1917	38,018	
20 per cent deducted for natural mortality	7,603	
2-year-old females Aug. 10, 1918		30,415
Yearling males, Aug. 10, 1917	38,013	
Males killed fall of 1917	1	
Males end of 1917	38,012	
20 per cent deducted for natural mortality	7,602	
2-year-old males beginning of 1918	30,410	
2-year-old males killed 1918	251	
2-year-old males Aug. 10, 1918		30,159

3-year-old males, estimated:		
2-year-old males Aug. 10, 1917	26,815	
2-year-old males killed fall 1917	179	
2-year-old males end of 1917	26,636	
4 per cent deducted for natural mortality	1,065	
3-year-old males beginning of 1918	25,571	
3-year-old males killed in 1918	16,454	
3-year-old males Aug. 10, 1918		9,117
4-year-old males, estimated:		
3-year-old males Aug. 10, 1917	19,507	
3-year-old males killed fall 1917	1,207	
4-year-old males beginning 1918	18,300	
4-year-old males killed in 1918	11,186	
4-year-old males Aug. 10, 1918		7,114
5-year-old males, estimated:		
4-year-old males Aug. 10, 1917	16,631	
4-year-old males killed fall 1917	396	
5-year-old males beginning 1918	16,235	
5-year-old males killed 1918	4,294	
5-year-old males, Aug. 10, 1918		11,941
6-year-old males, estimated:		
5-year-old males Aug. 10, 1917	14,813	
5-year-old males killed fall 1917	30	
6-year-old males beginning 1918	14,783	
6-year-old males killed 1918	1,028	
6-year-old males Aug. 10, 1918		13,755
Surplus bulls, counted and estimated:		
Breeding bulls in 1917	7,556	
20 per cent deducted for old-age loss	1,511	
1917 bulls remaining in 1918	6,045	
Breeding bulls in 1918	7,788	
1917 bulls remaining deducted	6,045	
Increment of new bulls in 1918	1,743	
6-year-old males in 1917	15,397	
Surplus bulls in 1917	8,977	
Total surplus bull stock for 1918	24,374	
20 per cent deducted for old-age loss	4,874	
Remaining surplus for 1918	19,500	
7-year-olds and over killed in 1918	647	
	18,853	
Increment of new breeding bulls for 1918 deducted	1,743	
Surplus bulls, Aug. 10, 1918		17,110

RECAPITULATION.

Pups	142,915
Cows	142,915
Harem bulls	5,344
Idle bulls	2,444
Yearling females	41,608
Yearling males	41,595
2-year-old females	30,415
2-year-old males	30,159
3-year-old males	9,117
4-year-old males	7,114
5-year-old males	11,941
6-year-old males	13,755
Surplus bulls	17,110
Total	496,432

MIGRATION OF ADULT SOCKEYE SALMON IN PUGET SOUND AND FRASER RIVER

By Henry O'Malley
Field Assistant, U. S. Bureau of Fisheries
In Charge of Operations on the Pacific Coast

and

Willis H. Rich
Field Assistant, U. S. Bureau of Fisheries

Appendix VIII to the Report of the U. S. Commissioner of Fisheries for 1918

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FIG. 1.

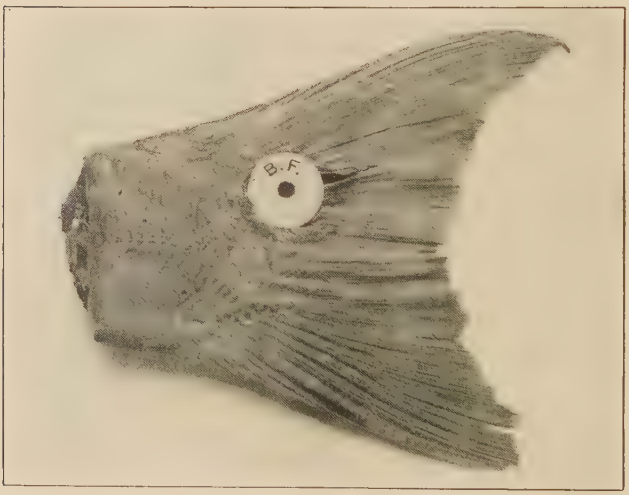

FIG. 2.

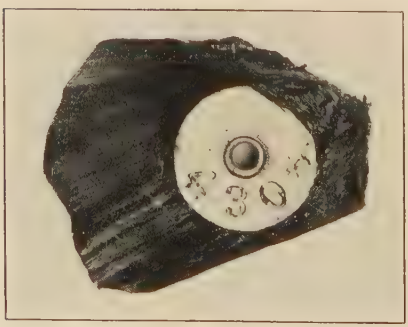

FIG. 3.

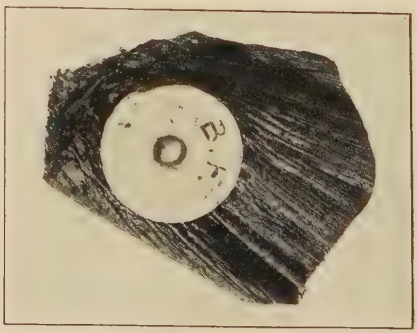

FIG. 4.

MIGRATION OF ADULT SOCKEYE SALMON IN PUGET SOUND AND FRASER RIVER.

By Henry O'Malley, *Field Assistant, U. S. Bureau of Fisheries, in Charge of Operations on the Pacific Coast,*
and
Willis H. Rich, *Field Assistant, U. S. Bureau of Fisheries.*

INTRODUCTION.

During the American-Canadian Fisheries Conference on the Pacific coast, in April and May, 1918, the question was constantly raised as to the time required for the sockeye salmon of Fraser River to pass through Puget Sound.

In order to determine this important question, Dr. Hugh M. Smith, United States Commissioner of Fisheries, and W. A. Found, superintendent of the Canadian fisheries, decided to carry out an extensive marking experiment. Early in July the authors were detailed to take immediate charge for the U. S. Bureau of Fisheries, and to confer with Lieut. Col. F. H. Cunningham, acting for the Canadian Government. The final arrangements were that the Canadian fisheries authorities would handle the marking operations in Canadian waters, the U. S. Bureau of Fisheries the marking operations in Puget Sound, and that each Government would attend to the collecting of data in its respective waters.

The authors are especially indebted to H. J. Todd & Sons; E. B. Deming, Pacific American Fisheries; W. A. Lowman, Coast Fish Co.; Frank Wright, Carlisle Packing Co.; and J. W. Elliott, Alaska Packers Association. Without the cooperation of these men and the members of their respective organizations it would have been impossible to have successfully conducted this experiment. L. H. Darwin, Washington State fish commissioner, and his deputies also rendered valuable assistance. Many helpful suggestions were received from Dr. Charles H. Gilbert, of Stanford University.

PROCEDURE.

TAGS AND THEIR ATTACHMENT.

The method adopted for procuring the desired data was to mark, with serially numbered tags, enough adult sockeye salmon so that a sufficient number of returns could reasonably be expected. After consideration of several types of tags the one finally accepted was of the "bachelor-button" type, similar to those in use for marking cattle

and other live stock. This button comes in two separate halves, each with a hollow central extension which forms the shaft of the complete button. The shaft of one half of the button is small enough to pass through the shaft and long enough to extend slightly beyond the face of the other half. When placed together in the proper position the two halves are fastened by means of a special crimping tool. This is built on the general plan of a pair of pliers; but the jaws meet only toward the tips, at which points are conical elevations. By fitting these elevations into the open ends of the shaft and closing the tool firmly, the end of the smaller inner shaft is spread sufficiently to prevent its being pulled back through the outer shaft.

The buttons were made of either silver or aluminum. Some fear was entertained that the aluminum might corrode in the salt water sufficiently to make it difficult or impossible to read the numbers, but in this experiment there was absolutely no difficulty on this account. No corrosion is noticeable on any of the buttons returned, although some of them must have been three or four weeks in practically pure salt water. This is contrary to the experience of Greene,[a] who found that salt water had a strongly corrosive action on aluminum buttons of similar style. This may have been due to some slight difference in the alloy of which the buttons were made.

The buttons were attached to the upper lobe of the caudal (tail) fin. It was first necessary to cut a hole of the proper size to admit the shaft of the button. This was done by means of an ordinary leather punch. Figures 1 to 4, Plate I, show, in situ, both sides of two buttons which were returned.

The operation of attaching the tags required, usually, less than one minute, and no particularly unfavorable results of tagging were noticed. At some of the stations where the marking was done the fish were held in crates until after the marking for the day was complete, and it was noticed that they soon recovered from the effects of being out of water while the tags were being attached and were apparently in perfect condition when liberated.

Reports that the tags were "worrying" the fish and causing them to wear their tails in an effort to remove the tags were investigated and found to be quite unfounded. Tails of several fish have been preserved and show no indication of such wearing as had been asserted. Figures 1 and 2, Plate I, are from such a specimen.

The fish to be marked were taken from the traps at the time of lifting and were held either in crates or in one of the pockets of the spiller until they could be marked and released.

MARKING STATIONS.

Marking stations were established at five points in Puget Sound, as follows: Near Sooke, Vancouver Island, British Columbia; Salmon Banks, just south of San Juan Archipelago; near Point Partridge, Whidby Island; near Village Point, Lummi Island; and at the last trap in American waters on Point Roberts. For convenience these have been designated in the following pages as stations A, B, C, D, and E, respectively.

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[a] Greene, Charles W.: The migration of salmon in the Columbia River. Bulletin, U. S. Bureau of Fisheries for 1909, Vol. XXIX, pp. 129–148. Washington, 1911.

CHART OF
STRAIT OF JUAN DE FUCA,
WASHINGTON SOUND,
FRASER RIVER,
AND
CONTIGUOUS WATERS.

Showing location of stations (indicated by letters) and regions (indicated by numbers) in sockeye salmon tagging experiments. 1918.

The work at these stations was in charge of the following men:

A. Sooke, British Columbia—
W. H. Rich, field assistant, U. S. Bureau of Fisheries. (July 14 to 23.)
Dr. C. McLean Fraser, director of the biological station, Nanaimo, British Columbia. (July 23 to the end of the season.)
Alex. Robertson, superintendent, Harrison Lake hatchery, Dominion fisheries department.
B. Salmon Banks—
Walter C. Buckmaster, apprentice fish-culturist, U. S. Bureau of Fisheries.
C. Point Partridge—
Clive L. Henry, apprentice fish-culturist, U. S. Bureau of Fisheries.
D. Lummi Island—
Don E. Courser, apprentice fish-culturist, U. S. Bureau of Fisheries.
E. Point Roberts—
Joseph Kemmerich, foreman, U. S. Bureau of Fisheries.

The last four of these stations were under the general supervision of Dennis Winn, field superintendent, U. S. Bureau of Fisheries.

COLLECTION AND ORGANIZATION OF DATA.

In the collection of data reliance was necessarily placed in fishermen, trap tenders, and cannery men. A reward of 25 cents was offered for the return of each button accompanied by information giving the date and place of capture. Specimens taken in American waters were taken care of by Dennis Winn, at the Seattle office of the U. S. Bureau of Fisheries, and those taken in Canadian waters by Col. Cunningham, at the office of the Dominion fisheries department at New Westminster, British Columbia. One of the tags reported from the upper regions of the Fraser River was secured by J. P. Babcock, assistant to the commissioner of fisheries for the Province of British Columbia.

While the majority of these records are considered approximately correct, data secured in this manner are necessarily subject to some inaccuracies, both as to time and place of capture. In the authors' opinion, however, these inaccuracies will be balanced so that with reasonably large series the averages should be reliable. In cases where the data were obviously wrong the records have been omitted. This has been done in several instances where the date given for the capture was earlier than that on which the fish was recorded as having been marked. A number of tags were returned with incomplete data, either the date or the place of capture, or both, wanting. All such cases have been omitted entirely from consideration.

For the convenient organization of the data the American waters of the Sound from which returns were reported have been divided into nine regions. Several factors guided in establishing the boundaries of these regions: (1) The general geography of the district, (2) the grouping of traps, and (3) the nature of the descriptions giving the locality where the tags were recovered. These last frequently indicated merely the general region in which the tag was taken, i. e., Rosario Strait. The boundaries of these regions, as well as the location of the marking stations, are shown on the accompanying map. All of the records reported from the Canadian waters which are open to commercial fishing have been treated together. For this reason that part of the Strait of Georgia just outside the mouths of the Fraser River and the river itself, from the mouth to Mission Bridge, together constitute the tenth region. The reasons for so treating the Canadian returns are given on pages 26 and 27.

STATISTICAL STUDY OF DATA.

GENERAL FEATURES.

In the following study the chief concern is with what is believed to be a strict and reasonably complete presentation of the facts. There has been no attempt to draw conclusions regarding the bearing of these facts upon the particular problems connected with the conservation of the sockeyes of the Fraser River. Some of the tables present similar data as seen from different points of view. This has, perhaps, been carried to an extreme in order that all obtainable facts might be available. Other tables are presented rather as matters of record than as having any especial bearing on the main problems in hand. For the most part such tables are presented without detailed comment.

RAW DATA.

Table 1 gives for each marking station the numbers of the tags attached each day. As noted in the table, silver tags were used only at Sooke (station A). At all other stations aluminum tags were used, and the first few tags used at Sooke were also of aluminum, numbers 5 to 29, inclusive.

TABLE 1.—LIST OF TAG NUMBERS ATTACHED AT EACH MARKING STATION.

STATION A, SOOKE, BRITISH COLUMBIA.[a]

Numbers.		Date.	Total.	Numbers.		Date.	Total.
From—	To—			From—	To—		
		1918.				1918.	
5	8	July 14	4	1718	1822	July 31	105
9	29	July 21	21	1823	1900	Aug. 1	77
1326	1350	do	25	1901	2038	Aug. 2	138
1353	1362	July 22	10	2039	2078	Aug. 4	41
1363	1382	July 23	20	2088	2100	do	23
1383	1390	July 24	8	2080	2087	Aug. 6	8
1391	1447	July 25	56	2101	2123	do	23
1448	1545	July 27	98	2125	2127	do	3
1546	1617	July 28	72				
1618	1717	July 30	99			Total	831

STATION B, SALMON BANKS, WASH.

		1918.				1918.	
3001	3025	July 21	25	3455	3496	July 31	42
3026	3065	July 22	40	3497	3600	Aug. 1	104
3066	3160	July 23	95	3601	3664	Aug. 2	64
3161	3216	July 24	56	3665	3758	Aug. 4	94
3217	3266	July 25	50	3759	3800	Aug. 5	42
3267	3377	July 26	111	3801	3836	Aug. 7	36
3401	3454	July 28	54				
3378	3394	July 30	17			Total	836
3395	3400	July 31	6				

STATION C, POINT PARTRIDGE, WASH.[b]

		1918.				1918.	
1001	1043	July 17	43	1547	1664	Aug. 7	118
1044	1093	July 19	50	1665	1769	Aug. 9	105
1094	1154	July 22	61	1770	1924	Aug. 13	155
1155	1230	July 24	76	1925	2000	Aug. 14	76
1231	1382	July 26	152				
1383	1546	Aug. 6	164			Total	1,000

[a] Tag Nos. 5 to 29, attached at station A, and the tags used at all other stations were aluminum. With the exception of those noted, all tags attached at station A were of silver.

[b] This is the official list as given by the assistant having charge of the marking at this station. The records for Aug. 6 and subsequent dates are subject to suspicion on account of an admitted lack of veracity in the accounts. Previous to this date Dennis Winn was present at the markings.

TABLE 1.—LIST OF TAG NUMBERS ATTACHED AT EACH MARKING STATION—Contd.

STATION D, LUMMI ISLAND, WASH.

Numbers.		Date.	Total.	Numbers.		Date.	Total.
From—	To—			From—	To—		
		1918.				1918.	
2001	2085	July 19	85	2478	2555	Aug. 5	78
2086	2177	July 23	92	2556	2649	Aug. 6	94
2178	2251	July 24	74	2650	2690	Aug. 7	41
2252	2314	July 28	63	2691	2737	Aug. 9	47
2315	2360	July 30	46				
2361	2416	Aug. 2	56			Total	737
2417	2477	Aug. 4	61				

STATION E, POINT ROBERTS, WASH.

		1918.				1918.	
4001	4095	July 25	95	4819	4834	Aug. 7	16
4096	4165	July 26	70	4835	4952	Aug. 8	118
4166	4258	July 29	93	30	85	Aug. 15	56
4259	4372	July 30	114	86	97	Aug. 16	12
4373	4494	July 31	122	98	120	Aug. 19	23
4495	4533	Aug. 1	39	121	151	Aug. 20	31
4534	4630	Aug. 2	97	152	167	Aug. 21	16
4631	4743	Aug. 5	113				
4744	4818	Aug. 6	75			Total	1,090

Table 2 gives in serial order for each station a complete list of the tags returned, showing the station where and the date on which the tags were attached, the date and region of capture, and the number of days en route. Tables 1 and 2 contain the raw data from which all of the subsequent tables were constructed.

TABLE 2.—LIST OF TAGS RETURNED.

TAGS ATTACHED AT STATION A, SOOKE, BRITISH COLUMBIA.

Tag No.	Date fish marked.	Date fish recaught.	Region where taken.	Days en route.	Tag No.	Date fish marked.	Date fish recaught.	Region where taken.	Days en route.
	1918.	1918.				1918.	1918.		
7	July 14	July 19	2	5	1362	July 22	July 23	1	1
12	July 21	July 23	9	2	1368	July 23	July 30	10	7
14	...do	Aug. 1	8	11	1371	...do	July 31	10	8
16	...do	Aug. 26	(a)	36	1390	July 24	July 29	6	5
19	...do	Aug. 1	(b)	11	1404	July 25	...do	9	4
21	...do	July 24	7	3	1405	...do	July 28	1	3
25	...do	July 25	9	4	1407	...do	Aug. 4	1	10
26	...do	July 23	2	2	1423	...do	July 30	8	5
27	...do	July 25	1	4	1449	July 27	Aug. 1	10	5
28	...do	July 24	2	3	1455	...do	July 30	1	3
29	...do	July 31	6	10	1463	...do	Aug. 2	6	6
1328	...do	July 25	2	4	1467	...do	July 31	9	4
1331	...do	July 26	2	5	1468	...do	July 30	6	3
1332	...do	July 23	1	2	1473	...do	Aug. 3	7	7
1335	...do	July 24	2	3	1477	...do	Aug. 5	7	9
1339	...do	...do	2	3	1481	...do	July 29	6	2
1342	...do	July 28	9	7	1486	...do	July 31	6	4
1353	July 22	...do	2	6	1505	...do	Aug. 1	(c)	5
1357	...do	July 26	10	4	1512	...do	Aug. 6	6	10
1359	...do	July 30	10	8	1513	...do	July 28	(d)	1

a Hell's Gate, 80 miles above Mission, Fraser River.
b Yale, 60 miles above Mission, Fraser River.
c No Point trap, Vancouver Island.
d Beachy trap, Vancouver Island.

TABLE 2.—LIST OF TAGS RETURNED—Continued.

TAGS ATTACHED AT STATION A, SOOKE, BRITISH COLUMBIA—Continued.

Tag No.	Date fish marked.	Date fish recaught.	Region where taken.	Days en route.	Tag No.	Date fish marked.	Date fish recaught.	Region where taken.	Days en route.
	1918.	1918.				1918.	1918.		
1515	July 27	Aug. 4	7	8	1796	July 31	Aug. 12	7	12
1519	...do	Sept. 14	(a)	49	1797	...do	Aug. 7	8	7
1529	...do	July 30	6	3	1801	...do	Aug. 18	8	18
1538	...do	Aug. 5	7	9	1806	...do	Aug. 13	8	13
1543	...do	July 30	7	3	1814	...do	Aug. 6	6	6
1546	July 28	July 29	6	1	1815	...do	Aug. 5	7	5
1549	...do	...do	1	1	1816	...do	...do	8	5
1551	...do	Aug. 1	(b)	4	1818	...do	Aug. 6	8	6
1565	...do	Aug. 4	7	7	1821	...do	Aug. 5	6	5
1573	...do	Aug. 23	9	26	1838	Aug. 1	Aug. 9	10	8
1588	...do	Aug. 2	6	4	1839	...do	Aug. 4	7	3
1591	...do	Aug. 9	6	12	1843	...do	Aug. 6	2	5
1592	...do	Aug. 5	10	8	1844	...do	Aug. 7	8	6
1593	...do	Aug. 4	8	7	1845	...do	Aug. 5	7	4
1597	...do	Aug. 9	6	12	1852	...do	Aug. 4	1	3
1602	...do	Aug. 4	7	7	1854	...do	Aug. 6	6	5
1607	...do	...do	8	7	1855	...do	Aug. 4	2	3
1610	...do	July 31	6	3	1857	...do	Aug. 5	6	4
1617	...do	Aug. 2	10	5	1870	...do	...do	7	4
1619	July 30	Aug. 1	4	2	1873	...do	Aug. 7	7	6
1629	...do	Aug. 7	8	8	1889	...do	Aug. 5	8	4
1633	...do	...do	7	8	1901	Aug. 2	Aug. 6	6	4
1637	...do	Aug. 6	2	7	1902	...do	Aug. 8	10	6
1646	...do	Aug. 1	(c)	2	1903	...do	Aug. 7	9	5
1653	...do	Aug. 6	7	7	1904	...do	Aug. 6	8	4
1658	...do	Aug. 1	(c)	2	1905	...do	Aug. 7	8	5
1662	...do	...do	(c)	2	1907	...do	Aug. 5	7	3
1663	...do	Aug. 7	9	7	1920	...do	Aug. 13	9	11
1664	...do	Aug. 11	6	12	1929	...do	...do	2	2
1665	...do	Aug. 1	(c)	2	1935	...do	Aug. 8	7	6
1667	...do	Aug. 11	8	12	1957	...do	Aug. 4	1	2
1672	...do	Aug. 9	7	10	1958	...do	Aug. 6	7	4
1673	...do	Aug. 5	6	6	1964	...do	Aug. 5	(c)	2
1682	...do	Aug. 1	1	1	1986	...do	...do	2	3
1686	...do	Aug. 6	2	7	1992	...do	Aug. 2	7	1
1697	...do	July 31	1	1	1996	...do	Aug. 4	7	2
1699	...do	Aug. 8	9	9	2004	...do	Aug. 8	8	6
1712	...do	Aug. 5	9	6	2015	...do	Aug. 6	6	4
1714	...do	Aug. 1	9	2	2018	...do	Aug. 12	10	10
1721	July 31	Aug. 5	8	5	2024	...do	Aug. 6	6	4
1727	...do	Aug. 3	7	3	2029	...do	Aug. 7	7	5
1735	...do	Aug. 18	10	18	2032	...do	Aug. 9	8	7
1738	...do	Aug. 4	2	5	2050	Aug. 4	Aug. 8	8	4
1739	...do	Aug. 8	7	8	2053	...do	Sept. 6	10	33
1753	...do	Aug. 14	8	14	2071	...do	Aug. 7	7	3
1756	...do	Aug. 5	8	5	2073	...do	Aug. 11	9	7
1761	...do	Aug. 6	7	6	2074	...do	Aug. 7	1	3
1764	...do	Aug. 4	7	4	2093	...do	...do	2	3
1767	...do	Aug. 11	7	11	2097	...do	Aug. 8	8	4
1769	...do	Aug. 9	10	9	2100	...do	Aug. 9	8	5
1778	...do	Aug. 11	7	11	2103	Aug. 6	...do	8	3
1780	...do	Aug. 16	8	16	2113	...do	...do	7	3
1783	...do	Aug. 5	6	5	2116	...do	Aug. 11	7	5
1786	...do	Aug. 18	10	18					

TAGS ATTACHED AT STATION B, SALMON BANKS, WASH.

	1918.	1918.				1918.	1918.		
3007	July 21	July 26	10	5	3052	July 22	July 23	2	1
3009	...do	July 29	1	8	3060	...do	July 24	2	2
3014	...do	...do	1	8	3062	...do	July 25	8	3
3015	...do	July 24	9	3	3070	July 23	...do	1	2
3024	...do	July 25	10	4	3075	...do	July 24	1	2
3028	July 22	July 24	2	2	3079	...do	July 25	1	2
3036	...do	Aug. 6	7	15	3086	...do	July 27	10	4
3037	...do	July 24	2	2	3087	...do	July 26	6	3
3039	...do	...do	1	2	3088	...do	July 25	9	2
3040	...do	July 25	2	3	3089	...do	July 26	2	3
3042	...do	July 29	8	7	3093	...do	...do	9	3
3050	...do	July 24	9	2	3103	...do	July 25	9	2

a Samaquam, Lillooet River, 25 miles above Harrison Lake, 90 miles above Mission.
b No Point trap, Vancouver Island.
c Beachy trap, Vancouver Island.

TABLE 2.—LIST OF TAGS RETURNED—Continued.

TAGS ATTACHED AT STATION B, SALMON BANKS, WASH.—Continued.

Tag No.	Date fish marked.	Date fish recaught.	Region where taken.	Days en route.	Tag No.	Date fish marked.	Date fish recaught.	Region where taken.	Days en route.
	1918.	1918.				1918.	1918.		
3104	July 23	July 28	10	5	3326	July 26	July 29	1	3
3111	...do....	July 29	10	6	3328	...do....	...do....	9	3
3118	...do....	July 24	1	1	3329	...do....	July 31	1	5
3121	...do....	July 26	1	3	3330	...do....	Aug. 22	9	27
3125	...do....	July 25	2	2	3335	...do....	July 29	10	3
3128	...do....	July 26	10	3	3337	...do....	July 30	10	4
3129	...do....	July 24	1	1	3339	...do....	Aug. 5	9	10
3133	...do....	July 28	10	5	3340	...do....	July 30	9	4
3134	...do....	July 25	4	2	3350	...do....	July 31	6	5
3143	...do....	July 29	10	6	3351	...do....	July 29	9	3
3146	...do....	July 28	10	5	3354	...do....	July 30	9	4
3147	...do....	July 29	9	5	3355	...do....	July 29	8	3
3148	...do....	...do....	6	6	3356	...do....	July 31	10	5
3149	...do....	July 23	10	1	3357	...do....	July 28	9	2
3150	...do....	July 26	8	3	3358	...do....	July 29	10	3
3153	...do....	July 31	2	8	3361	...do....	...do....	6	3
3158	...do....	Aug. 1	2	9	3366	...do....	Aug. 8	9	13
3160	...do....	July 29	9	6	3367	...do....	July 28	1	2
3168	July 24	July 26	9	2	3368	...do....	Aug. 1	8	6
3169	...do....	July 24	1	1	3372	...do....	July 30	10	4
3173	...do....	July 28	9	4	3375	...do....	July 31	10	5
3174	...do....	July 29	10	5	3377	...do....	...do....	8	5
3175	...do....	July 25	1	1	3378	July 30	Aug. 4	7	5
3176	...do....	July 28	2	4	3382	...do....	July 31	6	1
3180	...do....	Aug. 2	2	9	3394	...do....	Aug. 5	7	1
3184	...do....	July 26	9	2	3397	July 31	Aug. 1	7	1
3185	...do....	Aug. 2	10	9	3398	...do....	Aug. 4	7	4
3188	...do....	July 28	10	4	3399	...do....	Aug. 2	2	2
3189	...do....	July 30	6	6	3402	July 28	July 30	9	2
3194	...do....	July 26	6	2	3403	...do....	Aug. 1	7	4
3198	...do....	Sept. 15	(a)	53	3404	...do....	July 28	1	1
3199	...do....	July 29	10	5	3405	...do....	...do....	1	1
3200	...do....	July 25	4	1	3409	...do....	...do....	1	1
3205	...do....	Aug. 1	7	8	3410	...do....	Aug. 2	10	5
3210	...do....	July 25	6	1	3412	...do....	Aug. 9	9	12
3216	...do....	...do....	1	1	3414	...do....	July 30	7	2
3222	July 25	Aug. 2	8	8	3415	...do....	Aug. 4	2	7
3223	...do....	July 30	10	5	3418	...do....	July 30	9	2
3226	...do....	July 26	6	1	3423	...do....	...do....	9	2
3232	...do....	July 30	10	5	3425	...do....	July 29	1	1
3244	...do....	Aug. 7	10	13	3428	...do....	July 31	8	3
3245	...do....	Aug. 27	(b)	33	3432	...do....	Aug. 8	8	11
3246	...do....	Aug. 21	10	27	3433	...do....	July 31	6	3
3251	...do....	July 28	10	3	3434	...do....	July 30	10	2
3253	...do....	July 26	6	1	3437	...do....	Aug. 5	1	8
3255	...do....	Aug. 19	10	25	3441	...do....	Aug. 3	10	6
3257	...do....	July 29	10	4	3442	...do....	July 30	9	2
3259	...do....	Aug. 8	2	14	3443	...do....	Aug. 13	9	16
3266	...do....	Aug. 1	8	7	3444	...do....	July 29	1	1
3268	July 26	July 31	1	5	3445	...do....	...do....	1	1
3269	...do....	July 29	7	3	3446	...do....	July 30	2	2
3270	...do....	July 28	1	2	3448	...do....	July 31	8	3
3272	...do....	July 29	8	3	3450	...do....	Aug. 1	9	4
3273	...do....	July 28	10	2	3451	...do....	July 31	10	3
3274	...do....	...do....	1	2	3452	...do....	July 30	2	2
3275	...do....	...do....	1	2	3457	July 31	Aug. 6	7	6
3278	...do....	July 30	10	4	3460	...do....	Aug. 4	8	4
3281	...do....	July 31	(c)	5	3461	...do....	Aug. 3	8	3
3286	...do....	July 29	7	3	3462	...do....	Aug. 6	8	6
3288	...do....	July 28	1	2	3463	...do....	Aug. 30	(e)	30
3290	...do....	July 29	1	3	3469	...do....	Aug. 1	1	1
3294	...do....	...do....	9	3	3471	...do....	...do....	7	1
3295	...do....	July 28	1	2	3474	...do....	Aug. 2	6	2
3297	...do....	July 31	1	5	3475	...do....	...do....	1	2
3298	...do....	July 26	10	1	3478	...do....	Aug. 1	1	1
3299	...do....	Aug. 18	8	23	3481	...do....	...do....	8	1
3301	...do....	July 30	10	4	3484	...do....	Aug. 5	2	5
3309	...do....	July 29	1	3	3486	...do....	Aug. 1	2	1
3312	...do....	Aug. 1	9	6	3487	...do....	Aug. 2	8	2
3317	...do....	Aug. 5	7	10	3490	...do....	Aug. 4	7	4
3321	...do....	Sept. 15	(d)	51	3495	...do....	Aug. 2	8	2
3322	...do....	July 30	10	4	3496	...do....	Aug. 6	1	6

a Four miles above Pitt Lake, 30 miles from Fraser River, 50 miles from ocean.
b Soda Creek, 280 miles above Mission.
c Devil's Run, 10 miles above Mission.
d Four Mile Creek, Pitt River, 30 miles above Fraser River, 50 miles from ocean.
e Hagenson Slough, 30 miles above Fraser, 50 miles from ocean.

TABLE 2.—LIST OF TAGS RETURNED—Continued.

TAGS ATTACHED AT STATION B, SALMON BANKS, WASH.—Continued.

Tag No.	Date fish marked.	Date fish recaught.	Region where taken.	Days en route.
	1918.	1918.		
3501	Aug. 1	Aug. 2	1	1
3502	do	Aug. 5	8	4
3508	do	Aug. 2	6	1
3510	do	Aug. 12[a]	10	11
3513	do	Aug. 4	8	3
3514	do	Aug. 2	1	1
3518	do	Aug. 15	10	14
3522	do	Aug. 2	6	1
3523	do	do	1	1
3524	do	Aug. 5	8	4
3526	do	Aug. 2	9	1
3527	do	Aug. 4	8	3
3528	do	Aug. 6	8	5
3529	do	Aug. 4	10	3
3535	do	Aug. 5	7	4
3537	do	Aug. 2	6	1
3541	do	Aug. 5	2	4
3544	do	do	9	4
3545	do	Aug. 2	6	1
3547	do	Aug. 5	[b]	4
3548	do	Aug. 3	8	2
3550	do	Aug. 4	2	3
3551	do	Aug. 2	6	1
3552	do	Aug. 4	10	3
3553	do	Aug. 7	8	6
3554	do	Aug. 4	7	3
3555	do	do	8	3
3556	do	Aug. 5	8	4
3557	do	Aug. 11	8	10
3562	do	Aug. 2	6	1
3567	do	Aug. 1	4	1
3574	do	Aug. 4	8	3
3577	do	do	7	4
3578	do	Aug. 2	6	1
3579	do	Aug. 4	7	3
3582	do	Aug. 6	4	5
3583	do	do	8	5
3584	do	Aug. 12	7	11
3585	do	Aug. 5	9	4
3587	do	Aug. 2	1	1
3588	do	Aug. 5	1	4
3589	do	Aug. 7	8	6
3590	do	Aug. 5	8	4
3591	do	do	10	4
3594	do	Aug. 6	6	5
3598	do	Aug. 2	6	1
3605	Aug. 2	Aug. 5	8	3
3606	do	do	9	3
3610	do	Aug. 14	8	12
3613	do	Aug. 5	8	3
3617	do	Aug. 4	1	2
3619	do	Aug. 5	7	3
3624	do	do	1	3
3625	do	Aug. 7	8	5
3630	do	Aug. 4	1	2
3632	do	do	1	2
3633	do	Aug. 7	8	5
3634	do	do	9	5
3635	do	Aug. 4	1	2
3637	do	Aug. 14	2	12
3639	do	Aug. 17[c]	10	15
3642	do	Aug. 5	9	3
3643	do	do	9	3
3644	do	do	7	3
3646	do	do	9	3
3648	do	do	8	3
3653	do	do	7	3
3658	do	Aug. 6	10	4
3662	do	do	10	4
3663	do	Aug. 7	8	5
3667	Aug. 4	Aug. 5	1	1
3670	do	Aug. 10	8	6
3672	do	Aug. 4	6	2
3673	do	do	2	2
3677	do	do	2	2
3678	do	Aug. 9	8	5
3680	do	Aug. 20	10	16
3682	do	Aug. 7	8	3
3685	do	do	8	3
3687	do	do	8	3
3688	do	Aug. 18	9	14
3693	do	Sept. 17	[d]	44
3694	do	Aug. 14	2	10
3695	do	Aug. 6	8	2
3696	do	do	7	2
3699	do	Aug. 8	9	4
3700	do	Aug. 6	8	2
3702	do	Aug. 5	6	1
3703	do	Aug. 9[e]	10	5
3704	do	Aug. 6	7	2
3705	do	Aug. 7	10	3
3711	do	Aug. 6	2	2
3713	do	do	7	2
3714	do	Aug. 9	9	5
3715	do	Aug. 6	2	2
3718	do	Aug. 19	10	15
3721	do	Aug. 7	9	3
3722	do	Aug. 9	10	5
3727	do	Aug. 7	8	3
3728	do	do	9	3
3730	do	Aug. 6	2	2
3735	do	do	7	2
3737	do	Aug. 5	7	1
3739	do	do	1	1
3741	do	Aug. 6	7	2
3742	do	Aug. 8	8	4
3743	do	Aug. 7	6	3
3744	do	Aug. 16	[f]	12
3746	do	Aug. 8	10	4
3747	do	Aug. 11	7	7
3752	do	Aug. 23	9	19
3754	do	Aug. 7	1	3
3756	do	Aug. 6	7	2
3757	do	Aug. 5	1	1
3760	Aug. 5	Aug. 9	9	4
3762	do	Aug. 7	2	2
3764	do	Aug. 9	8	4
3773	do	Aug. 7	8	2
3775	do	Aug. 13	7	8
3777	do	Aug. 9	7	4
3778	do	Aug. 12	9	7
3779	do	Sept. 20	[d]	46
3780	do	Aug. 7	6	2
3783	do	Aug. 10	8	5
3789	do	Aug. 8	8	3
3790	do	do	9	3
3791	do	Aug. 7	7	2
3792	do	Aug. 6	7	1
3794	do	Aug. 8	2	3
3795	do	Aug. 9	9	4
3797	do	Aug. 12	10	7
3800	do	Aug. 18	9	13
3801	Aug. 7	Aug. 12	9	5
3805	do	Aug. 10	9	3
3806	do	do	8	3
3807	do	Aug. 9	7	2
3812	do	Aug. 11	8	4
3818	do	Sept. 3	[g]	27
3819	do	Aug. 14	9	7
3820	do	Aug. 12	10	5
3826	do	Aug. 13	10	6
3829	do	Aug. 18[h]	10	11
3835	do	Aug. 10	8	3

[a] The record is Sept. 12, but this is possibly a mistake, and the more probable date is Aug. 12, as tabulated.
[b] Fraser River, 5 miles above Yale, 60 miles above Mission.
[c] The record is Sept. 17, but this is possibly a mistake, and the more probable date is Aug. 17, as tabulated.
[d] Birkenhead River, 25 miles above Lillooet Lake, 130 miles above Mission, Fraser River.
[e] The record is Sept. 9, but this is possibly a mistake, and the more probable date is Aug. 9, as tabulated.
[f] Fraser River, 65 miles above Mission.
[g] Four Mile Creek, Pitt River, 30 miles above Fraser River, 50 miles from ocean.
[h] The record is Sept. 18, but this is possibly a mistake, and the more probable date is Aug. 18, as tabulated.

TABLE 2.—LIST OF TAGS RETURNED—Continued.

TAGS ATTACHED AT STATION C, POINT PARTRIDGE, WASH.

Tag No.	Date fish marked.	Date fish re-caught.	Region where taken.	Days en route.	Tag No.	Date fish marked.	Date fish re-caught.	Region where taken.	Days en route.
	1918.	1918.				1918.	1918.		
1001	July 17	July 19	7	2	1231	July 26	Aug. 5	9	10
1003	...do...	July 20	4	3	1235	...do...	July 30	8	4
1010	...do...	July 22	4	5	1238	...do...	July 29	2	3
1011	...do...	July 23	9	6	1239	...do...	Aug. 18	8	23
1017	...do...	July 20	8	3	1241	...do...	July 29	2	3
1018	...do...	July 23	9	6	1242	...do...	Aug. 1	7	6
1019	...do...	July 22	1	5	1244	...do...	July 29	8	3
1023	...do...	July 20	4	3	1249	...do...	Aug. 6	(c)	11
1030	...do...	July 22	1	5	1251	...do...	July 29	8	3
1031	...do...	July 21	10	4	1264	...do...	July 30	8	4
1036	...do...	July 20	1	3	1269	...do...	July 31	6	5
1037	...do...	July 25	1	8	1278	...do...	Aug. 1	8	6
1038	...do...	Aug. 17	(a)	31	1285	...do...	July 29	2	3
1041	...do...	July 24	7	7	1289	...do...	Aug. 18	10	23
1044	July 19	...do...	6	5	1290	...do...	July 29	8	3
1050	...do...	July 22	9	3	1293	...do...	Aug. 5	7	10
1052	...do...	July 24	6	5	1296	...do...	July 30	10	4
1055	...do...	July 22	2	3	1307	...do...	Aug. 1	8	6
1057	...do...	...do...	7	3	1308	...do...	Aug. 5	10	10
1058	...do...	...do...	3	3	1309	...do...	Aug. 2	2	7
1059	...do...	July 23	7	4	1310	...do...	July 30	9	4
1061	...do...	July 21	2	2	1313	...do...	July 28	8	2
1063	...do...	July 22	7	3	1317	...do...	Aug. 2	9	7
1067	...do...	July 24	8	5	1320	...do...	Aug. 11	8	16
1069	...do...	Aug. 2	8	14	1322	...do...	Aug. 5	10	10
1075	...do...	July 22	2	3	1328	...do...	July 30	6	4
1078	...do...	...do...	2	3	1330	...do...	...do...	1	4
1079	...do...	July 24	6	5	1334	...do...	...do...	10	4
1080	...do...	July 22	8	3	1337	...do...	...do...	9	4
1085	...do...	...do...	2	3	1344	...do...	July 29	1	3
1088	...do...	July 21	8	2	1346	...do...	...do...	1	3
1090	...do...	July 24	6	5	1347	...do...	...do...	1	3
1092	...do...	July 30	6	11	1351	...do...	Aug. 4	7	9
1094	July 22	July 26	8	4	1353	...do...	Aug. 1	8	6
1098	...do...	July 23	7	1	1354	...do...	...do...	8	6
1104	...do...	...do...	1	1	1355	...do...	...do...	10	6
1106	...do...	July 24	1	3	1357	...do...	Aug. 9	6	14
1107	...do...	July 25	2	3	1360	...do...	Aug. 1	2	6
1109	...do...	Aug. 12	10	21	1363	...do...	Aug. 12	7	17
1111	...do...	July 24	1	2	1366	...do...	Aug. 4	7	9
1116	...do...	July 25	8	3	1368	...do...	July 29	7	3
1124	...do...	July 24	6	2	1369	...do...	July 30	9	4
1128	...do...	July 30	8	8	1372	...do...	Aug. 16	9	21
1129	...do...	...do...	9	8	1373	...do...	Aug. 18d	10	23
1130	...do...	July 28	10	6	1374	...do...	July 30	8	4
1132	...do...	July 29	1	7	1375	...do...	July 29	1	3
1135	...do...	...do...	9	7	1377	...do...	Aug. 6	2	11
1138	...do...	July 24	2	2	1380	...do...	Aug. 1	9	6
1151	...do...	July 26	9	4	1424	Aug. 6	Aug. 7	2	1
1156	July 24	July 31	3	7	1438	...do...	Aug. 11	7	5
1157	...do...	Aug. 8	2	15	1548	Aug. 7	Aug. 9	1	2
1163	...do...	Aug. 10	(b)	17	1559	...do...	Aug. 14	8	7
1165	...do...	Aug. 1	8	8	1567	...do...	Aug. 7	2	1
1167	...do...	July 29	10	5	1569	...do...	Aug. 11	8	4
1169	...do...	July 30	2	6	1575	...do...	...do...	8	4
1173	...do...	Aug. 5	10	12	1577	...do...	Aug. 14	10	7
1175	...do...	Aug. 6	2	13	1579	...do...	Aug. 9	2	2
1176	...do...	July 29	6	5	1591	...do...	Aug. 13	8	5
1177	...do...	July 31	6	7	1598	...do...	...do...	4	6
1185	...do...	July 25	1	1	1604	...do...	Aug. 16	6	9
1192	...do...	July 31	10	7	1609	...do...	Aug. 13	8	6
1193	...do...	July 30	9	6	1617	...do...	Aug. 9	7	2
1194	...do...	Aug. 10	(b)	17	1628	...do...	Aug. 11	8	4
1196	...do...	July 29	1	5	1639	...do...	Aug. 13	9	5
1197	...do...	...do...	9	5	1673	Aug. 9	Aug. 16	8	7
1199	...do...	July 31	6	7	1677	...do...	Aug. 13	9	4
1205	...do...	July 30	2	6	1681	...do...	Aug. 18	8	9
1207	...do...	Aug. 1	9	8	1687	...do...	Aug. 14	6	5
1212	...do...	July 29	10	5	1689	...do...	Aug. 15	8	6
1213	...do...	Aug. 7	10	14	1691	...do...	Aug. 14	9	5
1221	...do...	July 30	8	6	1695	...do...	Aug. 13	8	4
1223	...do...	July 31	9	7	1704	...do...	Aug. 12	6	3
1228	...do...	...do...	1	7	1705	...do...	Aug. 13	8	4
1229	...do...	July 29	8	5	1717	...do...	...do...	7	4

a Devil's Run, 10 miles above Mission, Fraser River.
b Ebey's Landing, below Point Partridge.
c Otter Point, Vancouver Island.
d The record is Sept. 18, but this is possibly a mistake, and the more probable date is Aug. 18, as tabulated.

TABLE 2.—LIST OF TAGS RETURNED—Continued.

TAGS ATTACHED AT STATION C, POINT PARTRIDGE, WASH.—Continued.

Tag No.	Date fish marked.	Date fish recaught.	Region where taken.	Days en route.	Tag No.	Date fish marked.	Date fish recaught.	Region where taken.	Days en route.
	1918.	1918.				1918.	1918.		
1719	Aug. 9	Aug. 13	9	4	1865	Aug. 13	Aug. 15	1	2
1721	...do....	Aug. 14	8	5	1867	...do....	Aug. 19	7	6
1723	...do....	Aug. 11	1	2	1878	...do....	Aug. 16	1	3
1724	...do....	Aug. 12	6	3	1887	...do....	Aug. 22	9	9
1732	...do....	...do....	7	3	1889	...do....	Aug. 15	2	2
1735	...do....	Aug. 22	9	13	1891	...do....	Aug. 16	8	3
1736	...do....	Aug. 18	10	9	1897	...do....	Aug. 15	8	2
1741	...do....	Aug. 9	2	1	1899	...do....	Aug. 19	7	6
1743	...do....	Aug. 13	8	4	1900	...do....	Aug. 15	2	2
1746	...do....	Aug. 18	8	9	1907	...do....	...do....	1	2
1749	...do....	Aug. 12	8	3	1915	...do....	Aug. 16	9	3
1762	...do....	Aug. 23	6	14	1931	Aug. 14	Aug. 19	7	5
1763	...do....	Aug. 13	2	4	1932	...do....	...do....	7	5
1768	...do....	Aug. 14	9	5	1933	...do....	Aug. 23	10	9
1769	...do....	Aug. 13	8	4	1935	...do....	Aug. 16	6	2
1773	Aug. 13	Aug. 15	8	2	1939	...do....	...do....	2	2
1787	...do....	Aug. 21	9	8	1945	...do....	Sept. 3	10	19
1793	...do....	Aug. 18	9	5	1952	...do....	Aug. 19	7	5
1796	...do....	Aug. 13	2	1	1957	...do....	Aug. 17	1	2
1807	...do....	Aug. 17	9	4	1969	...do....	Aug. 16	2	3
1812	...do....	Aug. 14	2	1	1970	...do....	...do....	2	2
1820	...do....	Aug. 19	8	3	1976	...do....	Aug. 19	2	5
1835	...do....	Aug. 14	2	1	1982	...do....	Aug. 15	2	1
1846	...do....	Aug. 16	4	3	1986	...do....	Aug. 20	8	6
1851	...do....	...do....	8	3	1993	...do....	Aug. 15	2	1
1853	...do....	Aug. 18	8	5	1999	...do....	Aug. 25	10	11
1854	...do....	Aug. 16	8	3	2000	...do....	Aug. 16	2	2
1856	...do....	Aug. 14	1	1					

TAGS ATTACHED AT STATION D, LUMMI ISLAND, WASH.

	1918.	1918.				1918.	1918.		
2002	July 19	July 30	9	11	2125	Aug. 13	July 26	8	3
2003	...do....	July 22	8	3	2137	...do....	July 24	8	1
2013	...do....	...do....	8	3	2147	...do....	July 25	8	2
2015	...do....	...do....	8	3	2148	...do....	July 30	10	7
2020	...do....	...do....	10	3	2158	...do....	July 24	8	1
2031	...do....	...do....	8	3	2160	...do....	...do....	9	1
2033	...do....	July 23	9	4	2161	...do....	Aug. 13	10	21
2037	...do....	Aug. 6	8	18	2166	...do....	July 26	10	3
2038	...do....	July 21	8	2	2171	...do....	July 25	9	2
2039	...do....	July 22	8	3	2173	...do....	July 24	8	1
2040	...do....	July 25	9	6	2174	...do....	...do....	8	1
2044	...do....	July 24	9	3	2175	...do....	July 31	8	8
2049	...do....	...do....	8	5	2177	...do....	July 24	8	1
2051	...do....	Aug. 9	8	21	2181	July 24	Aug. 2	10	9
2052	...do....	July 22	8	3	2183	...do....	July 25	9	1
2055	...do....	...do....	7	3	2185	...do....	July 29	9	5
2057	...do....	July 23	9	4	2186	...do....	July 25	8	1
2061	...do....	July 22	8	3	2189	...do....	July 28	9	4
2063	...do....	July 24	8	1	2190	...do....	July 26	9	2
2065	...do....	July 22	8	3	2201	...do....	Aug. 6	9	13
2069	...do....	...do....	8	3	2210	...do....	Aug. 12	10	19
2072	...do....	July 21	9	2	2214	...do....	July 26	9	2
2073	...do....	July 24	8	5	2216	...do....	July 25	9	1
2075	...do....	...do....	7	5	2221	...do....	July 29	10	5
2078	...do....	July 22	8	3	2226	...do....	July 26	9	2
2079	...do....	...do....	9	3	2231	...do....	July 29	9	5
2082	...do....	July 23	9	4	2232	...do....	July 27	9	3
2084	...do....	Aug. 16	(a)	28	2234	...do....	July 28	9	4
2088	July 23	July 26	8	3	2237	...do....	July 29	10	5
2090	...do....	July 24	8	1	2238	...do....	July 26	9	2
2092	...do....	...do....	8	1	2240	...do....	July 29	9	5
2094	...do....	...do....	8	1	2241	...do....	July 26	9	2
2095	...do....	...do....	8	1	2242	...do....	July 30	9	6
2096	...do....	July 26	8	3	2246	...do....	July 25	8	1
2098	...do....	July 24	8	1	2250	...do....	July 28	8	4
2100	...do....	Aug. 2	(b)	10	2251	...do....	Aug. 5	10	12
2103	...do....	July 26	8	3	2252	July 28	Aug. 30	10	33
2108	...do....	July 25	9	2	2253	...do....	Aug. 7	9	10
2112	...do....	July 24	9	1	2255	...do....	July 29	9	1
2122	...do....	...do....	8	1	2257	...do....	July 30	8	2

a Soda Creek Canyon, 280 miles above Mission, Fraser River.
b Yale, 60 miles above Mission, Fraser River.

TABLE 2.—LIST OF TAGS RETURNED—Continued.

TAGS ATTACHED AT STATION D, LUMMI ISLAND, WASH.—Continued.

Tag No.	Date fish marked.	Date fish re-caught.	Region where taken.	Days en route.	Tag No.	Date fish marked.	Date fish re-caught.	Region where taken.	Days en route.
	1918.	1918.				1918.	1918.		
2259	July 28	Aug. 1	9	4	2438	Aug. 4	Aug. 5	8	1
2261	...do	July 30	8	2	2439	...do	Aug. 4	7	1
2265	...do	July 29	8	1	2440	...do	Aug. 5	9	3
2268	...do	Aug. 26	(a)	29	2441	...do	...do	8	1
2269	...do	July 31	8	3	2442	...do	Aug. 16	8	2
2270	...do	July 30	9	2	2443	...do	Aug. 6	9	2
2271	...do	Aug. 1	10	4	2444	...do	Aug. 5	9	1
2280	...do	July 30	8	2	2445	...do	...do	8	1
2282	...do	...do	9	2	2449	...do	...do	8	1
2285	...do	Aug. 11	10	15	2453	...do	...do	8	1
2286	...do	July 29	1	1	2455	...do	...do	8	1
2287	...do	July 30	9	2	2456	...do	Aug. 6	8	2
2288	...do	...do	9	2	2457	...do	...do	8	2
2289	...do	Aug. 8	10	11	2459	...do	Aug. 7	9	3
2290	...do	July 30	8	2	2464	...do	Aug. 5	9	1
2291	...do	Aug. 1	9	3	2465	...do	Sept. 3	10	30
2295	...do	July 30	9	2	2466	...do	Aug. 6	9	2
2300	...do	July 29	8	1	2469	...do	Aug. 5	8	1
2302	...do	July 30	9	2	2471	...do	Aug. 6	8	2
2304	...do	July 29	8	1	2472	...do	Aug. 5	9	1
2310	...do	...do	1	1	2474	...do	Aug. 6	9	2
2312	...do	July 30	9	1	2475	...do	...do	8	2
2313	...do	July 29	8	2	2476	...do	...do	8	2
2314	...do	July 30	9	2	2478	Aug. 5	...do	8	1
2315	July 30	Aug. 30	(b)	31	2482	...do	Aug. 7	8	2
2319	...do	Aug. 1	9	2	2485	...do	...do	9	2
2323	...do	Aug. 2	8	3	2487	...do	...do	8	2
2324	...do	Aug. 1	9	2	2488	...do	...do	9	2
2328	...do	...do	9	2	2492	...do	...do	9	2
2330	...do	July 31	10	1	2493	...do	Aug. 6	8	1
2331	...do	Aug. 2	10	3	2495	...do	...do	8	1
2335	...do	...do	8	3	2497	...do	...do	8	1
2338	...do	July 31	10	1	2501	...do	...do	9	1
2344	...do	July 30	8	1	2503	...do	Aug. 23[d]	10	18
2346	...do	Aug. 2	2	3	2507	...do	Sept. 20	(e)	46
2347	...do	Aug. 1	8	2	2510	...do	Aug. 7	8	2
2349	...do	July 31	9	1	2512	...do	Aug. 6	8	1
2358	...do	Aug. 1	8	2	2515	...do	Aug. 9	9	4
2359	...do	Aug. 2	10	3	2516	...do	Aug. 6	9	1
2365	Aug. 2	Aug. 4	8	2	2517	...do	Aug. 7	9	2
2367	...do	Aug. 5	7	3	2518	...do	Aug. 6	8	1
2368	...do	...do	10	3	2522	...do	Aug. 7	8	2
2370	...do	Aug. 4	8	2	2523	...do	Aug. 6	8	1
2373	...do	...do	8	2	2529	...do	Aug. 7	8	2
2375	...do	...do	8	2	2530	...do	Aug. 6	8	1
2376	...do	Aug. 5	9	3	2531	...do	Aug. 7	8	2
2381	...do	...do	9	3	2535	...do	Aug. 6	9	1
2384	...do	...do	8	3	2539	...do	Aug. 7	8	2
2389	...do	Aug. 2	9	1	2541	...do	Aug. 6	8	1
2391	...do	Aug. 6	8	4	2542	...do	Aug. 8	8	3
2394	...do	Aug. 25	10	23	2544	...do	Aug. 7	8	2
2401	...do	Aug. 4	9	2	2546	...do	...do	8	2
2403	...do	Aug. 5	9	3	2547	...do	Aug. 6	8	1
2404	...do	Aug. 13	10	11	2548	...do	Aug. 8	10	3
2405	...do	Aug. 5	9	3	2549	...do	...do	8	3
2410	...do	Aug. 2	9	1	2551	...do	Aug. 6	8	1
2413	...do	Aug. 9	9	7	2552	...do	Aug. 8	10	3
2414	...do	Aug. 5	9	3	2554	...do	Aug. 7	8	2
2416	...do	Aug. 8	9	6	2556	Aug. 6	...do	9	1
2420	Aug. 4	Aug. 7	8	3	2557	...do	Aug. 8	8	2
2421	...do	Aug. 5	8	1	2558	...do	Aug. 9	10	3
2424	...do	Aug. 6	8	2	2559	...do	Aug. 6	9	1
2426	...do	Aug. 4	7	1	2560	...do	Aug. 7	9	1
2428	...do	Aug. 5	7	1	2566	...do	Aug. 9	10	3
2429	...do	Aug. 19[c]	10	15	2569	...do	...do	9	3
2431	...do	Aug. 5	7	1	2570	...do	Aug. 6	9	1
2432	...do	...do	7	1	2574	...do	Aug. 9	9	3
2434	...do	Aug. 7	8	3	2575	...do	...do	10	3
2435	...do	Aug. 6	8	2	2576	...do	Aug. 16	(f)	10
2436	...do	...do	9	2	2578	...do	Aug. 11	7	5
2437	...do	Aug. 5	8	1	2579	...do	Aug. 9	8	3

a Hell's Gate, 80 miles above Mission, Fraser River.
b Lytton, 110 miles above Mission, Fraser River.
c The record is Sept. 19, but this is possibly a mistake, and the more probable date is Aug. 19, as tabulated.
d The record is Sept. 23, but this is possibly a mistake, and the more probable date is Aug. 23, as tabulated.
e Birkenhead River, 25 miles above Lillooet Lake, 130 miles above Mission, Fraser River.
f Strawberry Island, 50 miles above Mission, Fraser River.

TABLE 2.—LIST OF TAGS RETURNED—Continued.

TAGS ATTACHED AT STATION D, LUMMI ISLAND, WASH.—Continued.

Tag No.	Date fish marked.	Date fish recaught.	Region where taken.	Days en route.	Tag No.	Date fish marked.	Date fish recaught.	Region where taken.	Days en route.
	1918.	1918.				1918.	1918.		
2580	Aug. 6	Aug. 9	2	3	2651	Aug. 7	Aug. 12	8	5
2583	do	Aug. 7	8	1	2655	do	Aug. 9	8	2
2584	do	Aug. 10	8	4	2657	do	Aug. 8	8	1
2585	do	do	8	4	2659	do	do	9	1
2587	do	Aug. 11	8	5	2661	do	do	8	1
2588	do	Aug. 8	8	2	2662	do	Aug. 9	9	2
2589	do	Aug. 7	9	1	2666	do	Aug. 10	8	3
2591	do	do	9	1	2669	do	do	9	3
2592	do	do	9	1	2670	do	Aug. 9	9	2
2593	do	Aug. 6	9	1	2672	do	do	9	2
2595	do	Aug. 9	8	3	2675	do	do	8	2
2598	do	Aug. 12	8	6	2676	do	Sept. 16	(b)	40
2602	do	Aug. 9	9	3	2678	do	Aug. 10	8	3
2603	do	do	10	3	2682	do	Aug. 12	10	5
2604	do	Aug. 8	8	2	2683	do	Aug. 9	8	2
2605	do	Aug. 9	9	3	2684	do	do	9	2
2610	do	do	9	3	2685	do	do	9	2
2611	do	Aug. 7	8	1	2686	do	Aug. 12	9	5
2612	do	Aug. 12	8	6	2687	do	Aug. 8	8	1
2614	do	Aug. 8	9	2	2688	do	do	8	1
2616	do	Aug. 7	9	1	2689	do	do	9	1
2618	do	Aug. 8	10	2	2692	Aug. 9	Aug. 11	8	2
2621	do	Aug. 9	8	3	2699	do	do	8	2
2622	do	Aug. 10	9	4	2707	do	Aug. 13	9	4
2623	do	Aug. 11	9	5	2710	do	Sept. 4	(c)	26
2625	do	Aug. 8	9	2	2713	do	Aug. 16	8	7
2627	do	Aug. 7	8	1	2717	do	Aug. 12	9	3
2628	do	do	9	1	2718	do	Aug. 14	10	5
2629	do	Aug. 11	10	5	2719	do	Aug. 12	10	3
2630	do	Aug. 8	9	2	2720	do	Aug. 15	8	6
2631	do	Aug. 11	7	5	2722	do	Aug. 13	9	4
2633	do	Aug. 9	9	3	2726	do	Aug. 14	9	5
2634	do	Aug. 15	9	9	2728	do	Aug. 12	10	3
2635	do	Aug. 7	9	1	2733	do	Aug. 11	8	2
2636	do	Aug. 8	8	2	2734	do	Aug. 11–13	9	3
2642	do	do	9	2					
2645	do	Aug. 7	8	1	2736	do	Aug. 14	9	5
2646	do	Aug. 8	8	2	2737	do	Aug. 19	7	10
2648	do	Sept. 19	(a)	44					

TAGS ATTACHED AT STATION E, POINT ROBERTS, WASH.

	1918.	1918.				1918.	1918.		
36	Aug. 15	Aug. 18	10	3	4001	July 25	July 29	10	4
38	do	Aug. 16	10	1	4007	do	Aug. 4	7	11
72	do	Sept. 20	(d)	36	4008	do	July 26	10	1
74	do	Sept. 24	(d)	40	4012	do	Aug. 5	(g)	11
75	do	Sept. 21	(d)	37	4025	do	July 30	10	5
83	do	Sept. 15	(d)	31	4047	do	July 29	(h)	4
84	do	Sept. 10	10	26	4065	do	July 28	10	3
90	Aug. 16	Sept. 2	(e)	17	4071	do	July 29	10	4
100	Aug. 19	Aug. 19	10	1	4103	July 26	Aug. 3	10	8
113	do	Aug. 22	10	3	4104	do	July 29	10	3
126	Aug. 20	Aug. 21	10	1	4107	do	July 30	10	4
127	do	Aug. 22	10	2	4109	do	July 29	10	3
130	do	Sept. 5	10	16	4117	do	July 31	10	5
137	do	Aug. 28	10	8	4121	do	July 30	10	4
140	do	Aug. 22	10	2	4122	do	July 28	10	2
149	do	do	10	2	4129	do	July 29	10	3
151	do	do	10	2	4138	do	do	10	3
156	Aug. 21	Aug. 21	10	1	4142	do	July 28	10	2
164	do	Oct. 7	(d)	47	4150	do	Aug. 5	(i)	10
165	do	Aug. 21	10	1	4166	July 29	Aug. 9	10	11
167	do	Aug. 27[f]	10	6	4174	do	Aug. 16	(j)	18

a Four miles above Pitt Lake, 30 miles from Fraser River, 50 miles from ocean.
b Near Spuzzum, 65 miles above Mission, Fraser River.
c Mountain Slough, above Pitt Lake, 30 miles from Fraser River, 50 miles from ocean.
d Birkenhead River, 25 miles above Lillooet Lake, 130 miles above Mission, Fraser River.
e Samaquam, Lillooet River, 25 miles above Harrison Lake, 90 miles above Mission.
f The record is Sept. 27, but this is possibly a mistake, and the more probable date is Aug. 27, as tabulated.
g Five miles above Yale, 65 miles above Mission, Fraser River.
h Mouth of Chilliwack River, 12 miles above Mission, Fraser River.
i Yale, 60 miles above Mission, Fraser River.
j Strawberry Island, 50 miles above Mission, Fraser River.

TABLE 2.—LIST OF TAGS RETURNED—Continued.

TAGS ATTACHED AT STATION E, POINT ROBERTS, WASH.—Continued.

Tag No.	Date fish marked.	Date fish recaught.	Region where taken.	Days en route.	Tag No.	Date fish marked.	Date fish recaught.	Region where taken.	Days en route.
	1918.	1918.				1918.	1918.		
4183	July 29	Aug. 2	8	4	4405	July 31	Aug. 11	10	11
4187	do	Aug. 4	10	6	4407	do	Aug. 15	10	15
4196	do	Aug. 12	10	14	4415	do	Aug. 2	10	2
4198	do	Sept. 12	(a)	45	4417	do	Aug. 5	10	6
4203	do	Aug. 2	8	4	4423	do	Aug. 1	10	1
4207	do	July 30	10	1	4432	do	do	9	1
4209	do	Aug. 5	10	7	4434	do	July 31	10	1
4211	do	July 30	10	1	4436	do	Aug. 30	10	30
4216	do	Aug. 2	9	4	4438	do	Aug. 11	7	11
4219	do	July 31	10	2	4446	do	Aug. 2	10	2
4220	do	do	10	2	4447	do	Aug. 21	10	21
4221	do	July 30	10	1	4454	do	Aug. 6	8	6
4246	do	Aug. 1	9	3	4461	do	Aug. 7	10	7
4249	do	Aug. 5	(b)	6	4464	do	do	10	7
4252	do	Aug. 7	(c)	9	4467	do	Aug. 5	8	5
4258	do	Aug. 1	8	3	4468	do	Aug. 16	8	16
4264	July 30	Aug. 2	10	3	4474	do	Aug. 20	10	20
4267	do	do	10	3	4476	do	Aug. 5	9	5
4268	do	Aug. 3	8	4	4478	do	Aug. 9	10	9
4270	do	July 30	10	1	4480	do	Aug. 5	10	5
4271	do	Aug. 2	10	3	4481	do	Aug. 7	10	7
4274	do	Aug. 5	10	6	4482	do	Aug. 28	(h)	28
4277	do	July 31	10	1	4483	do	Aug. 2	10	2
4279	do	Aug. 16	10	17	4485	do	Aug. 5	9	5
4283	do	Aug. 5	10	6	4486	do	Aug. 2	10	2
4284	do	Aug. 6	10	7	4487	do	Aug. 5	8	5
4286	do	Aug. 20	(d)	21	4488	do	Aug. 1	10	1
4288	do	Aug. 2	8	3	4489	do	July 31	10	1
4289	do	do	10	3	4491	do	Aug. 1	9	1
4291	do	Aug. 26	10	27	4492	do	Aug. 6	10	6
4296	do	Aug. 14	9	15	4499	Aug. 1	Aug. 4	10	3
4300	do	Aug. 4	8	5	4500	do	Aug. 8	10	7
4305	do	Sept. 13	(f)	45	4502	do	Aug. 12	9	11
4315	do	Aug. 6	9	7	4506	do	Aug. 19	10	18
4317	do	Aug. 2	10	3	4508	do	Aug. 13	10	12
4327	do	Aug. 30	(g)	31	4509	do	Aug. 4	10	3
4331	do	Aug. 1	10	2	4511	do	Sept. 2	10	32
4340	do	Aug. 4	9	5	4515	do	Aug. 4	10	3
4348	do	July 30	10	1	4516	do	Aug. 12	10	11
4349	do	do	10	1	4521	do	Aug. 6	10	5
4352	do	Aug. 9	(h)	10	4524	do	Aug. 21	10	20
4353	do	July 30	9	1	4525	do	Aug. 2	10	1
4356	do	July 31	10	1	4526	do	Aug. 6	10	5
4357	do	Aug. 4	10	5	4533	do	Aug. 2	10	1
4359	do	Aug. 7	10	8	4534	Aug. 2	Aug. 5	10	3
4360	do	Aug. 8	9	9	4540	do	do	10	3
4367	do	Aug. 6	10	7	4544	do	Aug. 11	10	9
4368	do	Aug. 27	(i)	28	4545	do	Aug. 7	(c)	5
4370	do	Sept. 14	(j)	46	4547	do	Aug. 5	(l)	3
4375	July 31	Sept. 10	(a)	41	4553	do	Aug. 4	10	2
4376	do	Aug. 15	10	15	4556	do	Aug. 5	10	3
4381	do	Aug. 7	8	7	4558	do	Aug. 4	10	2
4383	do	Aug. 1	10	1	4560	do	Aug. 12	8	10
4384	do	Aug. 6	10	6	4562	do	Aug. 8	10	6
4389	do	Aug. 21	10	21	4569	do	Aug. 4	10	2
4392	do	July 31	10	1	4573	do	Aug. 5	10	3
4393	do	Aug. 30	10	30	4595	do	Aug. 7	10	5
4402	do	Aug. 5	9	5	4596	do	Aug. 9	8	7
4403	do	Aug. 1	10	1	4601	do	Aug. 20	10	18
4404	do	Aug. 4	7	4	4603	do	Aug. 13	(m)	11

a Portage Creek, foot of Anderson Lake, 170 miles above Mission.
b Twenty-seven miles above Mission, Fraser River.
c Devils Run, 10 miles above Mission, Fraser River.
d Tenmile House, above Harrison Lake, 75 miles above Mission.
e The record is Sept. 26, but this is possibly a mistake, and the more probable date is Aug. 26, as tabulated
f Chilcoten River, 235 miles above Mission.
g Lillooet Bridge, 150 miles above Mission, Fraser River.
h Hell's Gate, 80 miles above Mission, Fraser River.
i Skookum Chuck, on Lillooet River, 12 miles above Harrison Lake, 75 miles above Mission.
j Birkenhead River, 25 miles above Lillooet River, 130 miles above Mission, Fraser River.
k The record is Sept. 8, but this is possibly a mistake, and the more probable date is Aug. 8, as tabulated.
l Three miles above Mission, Fraser River.
m Trafalgar Flat, 50 miles above Mission, Fraser River.

TABLE 2.—LIST OF TAGS RETURNED—Continued.

TAGS ATTACHED AT STATION E, POINT ROBERTS, WASH.—Continued.

Tag No.	Date fish marked.	Date fish recaught.	Region where taken.	Days en route.	Tag No.	Date fish marked.	Date fish recaught.	Region where taken.	Days en route.
	1918.	1918.				1918.	1918.		
4606	Aug. 2	Aug. 4	10	2	4759	Aug. 6	Aug. 30	10	24
4607	...do...	Aug. 7	9	5	4760	...do...	Aug. 16	10	10
4608	...do...	Aug. 5	10	3	4765	...do...	Aug. 8	10	2
4609	...do...	Aug. 6	9	4	4773	...do...	Aug. 12	10	6
4610	...do...	Sept. 11	(a)	40	4776	...do...	Aug. 20c	10	14
4614	...do...	Aug. 5	9	3	4777	...do...	Aug. 7	10	1
4622	...do...	Aug. 11	9	9	4780	...do...	Aug. 11	9	5
4627	...do...	...do...	10	9	4784	...do...	Aug. 9	9	3
4633	Aug. 5	Aug. 20	9	15	4790	...do...	Aug. 18	10	12
4635	...do...	Aug. 9	6	4	4791	...do...	Aug. 7	10	1
4639	...do...	Aug. 20	10	15	4796	...do...	Aug. 19	10	13
4646	...do...	Aug. 9	10	4	4799	...do...	Aug. 26	10	20
4653	...do...	Nov. 16	(b)	103	4800	...do...	Aug. 13	10	7
4654	...do...	Aug. 11	10	6	4801	...do...	Aug. 6	10	10
4657	...do...	Aug. 13	10	8	4803	...do...	Aug. 7	10	1
4660	...do...	Aug. 7	10	2	4808	...do...	Aug. 8	10	2
4663	...do...	Aug. 9	10	4	4809	...do...	Aug. 30	10	24
4664	...do...	Aug. 11	9	6	4812	...do...	Aug. 12	10	6
4669	...do...	Aug. 6	10	1	4813	...do...	Aug. 8	10	2
4670	...do...	Aug. 15	10	10	4814	...do...	...do...	10	2
4677	...do...	Aug. 7	10	2	4818	...do...	Aug. 22d	10	16
4686	...do...	Aug. 18	10	13	4823	Aug. 7	Aug. 13	10	6
4687	...do...	Aug. 8	10	3	4825	...do...	Aug. 9	9	2
4691	...do...	Aug. 11	7	6	4828	...do...	Aug. 7	10	1
4692	...do...	Aug. 16	9	11	4830	...do...	Aug. 16	(e)	9
4694	...do...	Sept. 6	10	32	4831	...do...	Aug. 7	10	1
4708	...do...	Aug. 12	9	7	4833	...do...	Aug. 10	10	3
4709	...do...	...do...	10	7	4836	Aug. 8	Aug. 18	10	10
4713	...do...	Sept. 5	10	31	4847	...do...	Aug. 12	10	4
4714	...do...	Aug. 12	10	7	4861	...do...	Aug. 8	10	1
4732	...do...	Aug. 20	10	15	4869	...do...	Aug. 10	10	2
4733	...do...	Aug. 6	10	1	4870	...do...	Aug. 19	(f)	11
4735	...do...	Aug. 9	9	4	4879	...do...	Aug. 18	8	10
4738	...do...	Aug. 26	10	21	4883	...do...	Aug. 12	9	4
4740	...do...	Aug. 9	10	4	4886	...do...	Aug. 10	10	2
4751	Aug. 6	...do...	10	3	4896	...do...	Aug. 12	10	4
4753	...do...	Aug. 12	9	6	4913	...do...	...do...	10	4
4754	...do...	Aug. 6	10	1	4914	...do...	Aug. 9	10	1
4756	...do...	Aug. 18	10	12	4921	...do...	Aug. 11	10	3

a Samaquam, Lillooet River, 25 miles above Harrison Lake, 90 miles above Mission.
b Mouth of Seymour Creek, Burrard Inlet, at North Vancouver.
c The record is Sept. 20, but this is possibly a mistake, and the more propable date is Aug. 20, as tabulated.
d The record is Sept. 22, but this is possibly a mistake, and the more probable date is Aug. 22, as tabulated.
e American Bar, 50 miles above Mission, Fraser River.
f Trafalgar Flat, 50 miles above Mission, Fraser River.

PERCENTAGE OF RETURNS.

Table 3 shows the percentage of returns from each day's marking at each station. The data from which the percentages were obtained are also given. In general the returns indicate that the marking was quite uniformly successful. This is especially true with that done at stations B and D. The marking done at station A suffered somewhat in efficiency for a few days at the time the change was made in the personnel but otherwise is satisfactory. The records from station E show a sudden diminution in the percentage of returns on August 8 and for the following three days on which fish were marked. No explanation can be given for this. As stated (note to Table 1, station C), the accuracy of the August records for station C is subject to considerable question, and the operator at this point has admitted reporting incorrectly the number of fish marked on August 6. But 2 out of 164 reported marked on this date were recovered, a much lower percentage than was obtained from any other day's marking. These facts have thrown the record of

marking done at this station during August so much under suspicion that it was considered necessary, in certain phases of the study, to disregard entirely the returns.

It is important to call attention to the fact that the figures given in Table 3 can not be accepted as giving any adequate idea of the percentage of fish entering from the ocean which are caught while passing through the waters where commercial fishing is permitted. Several indeterminate factors must modify the percentage of returns to such an extent that, while they are reasonably comparable inter se, the actual figures give a much-distorted idea of the toll taken from the run as it is passing through the Sound and river. Two of these factors are especially obvious, i. e.: (1) The figures as given here do not include all of the actual returns, since some were omitted on account of faulty or incomplete data; the error from this factor, however, is not great, approximately 5 per cent; (2) a much more important source of error is due to lost tags. There are no means of knowing just how many were taken and not turned in. Nor can anything more be learned as to the number of tags lost from the fish between the time they were attached and the time the fish were captured. Numerous reliable reports came to us of fish that showed splits in the tail fins terminating in holes similar to the one made with the leather punch. Apparently the tags had in some manner become caught and pulled out. Another possibility is that some of the fish were unable to stand the operation necessary to the attachment of the tag, more particularly the attendant handling and removal from the water.

All of these factors would tend to increase the percentage of fish captured, but obviously there are no means for determining to what extent.

TABLE 3.—NUMBER OF FISH MARKED EACH DAY, TOTAL NUMBER OF RETURNS FROM EACH DAY'S MARKING, AND PERCENTAGES OF RETURNS FOR EACH STATION, 1918.

Date marked.	Station A.			Station B.			Station C.		
	Marked.	Returned.	Percentage returned.	Marked.	Returned.	Percentage returned.	Marked.	Returned.	Percentage returned.
July 14	4	1	25						
17							43	14	32
19							50	19	38
21	46	16	35	25	5	20			
22	10	4	40	40	10	25	61	16	26
23	20	2	10	95	27	28			
24	8	1	12	56	18	32	76	25	33
25	56	4	7	50	13	26			
26				111	45	40	152	48	32
27	98	16	16						
28	72	15	21	54	27	50			
30	99	20	20	17	3	18			
31	105	24	23	48	20	42			
Aug. 1	77	12	16	104	46	44			
2	138	21	15	64	24	38			
4	64	8	12	94	44	47			
5				42	18	43			
6	34	3	9				164	2	1
7				36	11	31	118	14	12
9							105	25	24
13							155	24	15
14							76	16	21
Total	831	147	17.7	836	311	37.3	1,000	203	20.3

TABLE 3.—NUMBER OF FISH MARKED EACH DAY, TOTAL NUMBER OF RETURNS FROM EACH DAY'S MARKING, AND PERCENTAGES OF RETURNS FOR EACH STATION, 1918—Continued.

Date marked.	Station D.			Station E.		
	Marked.	Returned.	Percentage returned.	Marked.	Returned.	Percentage returned.
July 19	85	28	33			
23	92	25	27			
24	74	23	31			
25				95	8	8
26				70	11	16
28	63	28	44			
29				93	18	19
30	46	15	33	114	33	29
31				122	41	34
Aug. 1				39	14	36
2	56	20	36	97	24	25
4	61	35	57			
5	78	35	45	113	27	24
6	94	52	55	75	25	33
7	41	21	51	16	6	37
8				118	12	10
9	47	16	34			
15				56	7	12
16				12	1	8
19				23	2	9
20				31	7	23
21				16	4	25
Total	737	298	40.5	1,090	240	22

Total number marked	4,494
Total number returned	1,199
Percentage returned	26.6

Among the specimens listed in Table 2 the following were recorded as having been taken outside the limits of the regions indicated on the map and from waters other than the Fraser River above Mission Bridge:

	Days out.
1 specimen, Burrard Islet, marked Aug. 5, station E	103?
2 specimens, Ebey's Landing, marked July 24, station C	17
1 specimen, near Sooke, British Columbia, marked July 26, station C	11
2 specimens, near Sooke, British Columbia, marked July 27, station A	1–5
1 specimen, near Sooke, British Columbia, marked July 28, station A	4
4 specimens, near Sooke, British Columbia, marked July 30, station A	2
1 specimen, near Sooke, British Columbia, marked Aug. 2, station A	2

These specimens from without the limits were so few that they have been omitted from further consideration. It seems probable that, with the exception of the specimens marked at station A and taken near Sooke, these represent runs of sockeyes which were bound to some stream other than the Fraser River.

In the following tables separate consideration has been given to those fish which came from the tributaries of the Fraser and from the main river above Mission Bridge. The problems connected with the fish from these upper waters are sufficiently distinct from those connected with the fish taken by commercial fishermen to demand such separate treatment.

Table 4 gives the number of specimens returned (1) from the main commercial fishing grounds, (2) from the upper Fraser River, and (3) from outside these limits.

TABLE 4.—NUMBER OF MARKED FISH TAKEN IN NUMBERED DISTRICTS OF PUGET SOUND AND FRASER RIVER, UPPER FRASER RIVER, AND OUTSIDE THESE BOUNDARIES.

Marking station.	Total returned.	Number from—		
		Main districts.	Upper Frazer River.	Outside limits.
A	147	136	3	8
B	311	301	10	.....
C	203	199	1	3
D	298	289	9	.....
E	240	212	27	1
Total	1,199	1,137	50	12

DETAILED STUDY OF RETURNS FROM THE COMMERCIAL FISHING DISTRICTS.

Two tables have been prepared for each of the marking stations, presenting in detail the data obtained from the marking: First, a table showing for each day's marking the number and percentage of specimens recovered from each region and the average number of days required for the journey; second, a table showing the distribution of returns according to the region from which the return was reported and the number of days en route. This last is given as a matter of record and in order to show something of the range of variation underlying the average rates of progress as given in various other tables. It is upon the data given in these tables that the general discussions of the routes and rates of travel which immediately follow are based.

TABLE 5.—NUMBER AND PERCENTAGE OF SPECIMENS FROM EACH DAY'S MARKING AT STATION A TAKEN IN EACH REGION AND AVERAGE NUMBER OF DAYS EN ROUTE, 1918.[a]

Date marked.	1		2		4		6		7	
	Fish.	Days.	Fish.	Days.	Fish.	Days.	Fish.	Days.	Fish.	Days.
July 14	.....	.....	1	5.0	.....	.....	.....	.....	.....	.....
21	2	3.0	6	3.3	.....	.....	1	10.0	1	3.0
22	1	1.0	1	6.0	.....	.....	.....	.....	.....	.....
24	.....	.....	.....	.....	.....	.....	1	5.0	.....	.....
25	2	6.5	.....	.....	.....	.....	.....	.....	.....	.....
27	1	3.0	.....	.....	.....	.....	6	3.7	4	8.5
28	1	1.0	.....	.....	.....	.....	5	6.4	3	5.3
30	2	1.0	2	7.0	1	2.0	2	9.0	3	8.3
31	.....	.....	1	5.0	.....	.....	3	5.3	8	7.5
Aug. 1	1	3.0	2	4.0	.....	.....	2	4.5	4	4.2
2	1	2.0	2	2.5	.....	.....	3	4.0	6	3.5
4	1	3.0	1	3.0	.....	.....	.....	.....	1	3.0
6	.....	.....	.....	.....	.....	.....	.....	.....	2	4.0
Total	12	.....	16	.....	1	.....	23	.....	32	.....
Average [b]	.....	2.8	.....	4.1	.....	2.0	.....	5.7	.....	5.8

[a] No specimens marked at station A were recovered in regions 3 and 5.
[b] Weighted mean.

TABLE 5.—NUMBER AND PERCENTAGE OF SPECIMENS FROM EACH DAY'S MARKING AT STATION A TAKEN IN EACH REGION AND AVERAGE NUMBER OF DAYS EN ROUTE, 1918—Continued.

Date marked.	8		9		10		Total marked.	Total returned.	Percentage returned.
	Fish.	Days.	Fish.	Days.	Fish.	Days.			
July 14							4	1	25
21	1	11.0	3	4.3			46	14	30
22					2	6.0	10	4	40
23					2	7.5	20	2	10
24							8	1	12
25	1	5.0	1	4.0			56	4	7
27			1	4.0	1	5.0	98	13	13
28	2	7.0	1	26.0	2	6.5	72	14	19
30	2	10.0	4	6.0			99	16	16
31	9	9.9			3	15.0	105	24	23
Aug. 1	2	5.0			1	8.0	77	12	16
2	4	5.5	2	8.0	2	8.0	138	20	14
4	3	4.3	1	7.0	1	33.0	64	8	12
6	1	3.0					34	3	9
Total	25		13		14		831	136	16.3
Average [a]		7.5		7.2		10.5			

[a] Weighted mean.

TABLE 6.—DISTRIBUTION OF RETURNS FROM MARKING AT STATION A ACCORDING TO REGION IN WHICH CAPTURED AND NUMBER OF DAYS EN ROUTE.[a]

Days en route.	1	2	4	6	7	8	9	10
1	4			1	1			
2	2	2	1	1	2		2	
3	4	6		3	6	1		
4	1	1		6	4	4	3	1
5		4		5	3	6	1	2
6		1		2	3	3	1	1
7		2			4	4	3	1
8					3	1		4
9					2		1	1
10	1			2	1			1
11					2	1	1	
12				3	1	1		
13						1		
14						1		
16						1		
18						1		2
26							1	
33								1
Total	12	16	1	23	32	25	13	14

[a] No specimens marked at station A were recovered in regions 3 and 5.

TABLE 7.—NUMBER AND PERCENTAGE OF SPECIMENS FROM EACH DAY'S MARKING AT STATION B TAKEN IN EACH REGION AND AVERAGE NUMBER OF DAYS EN ROUTE, 1918.[a]

Date marked.	1		2		4		6		7	
	Fish.	Days.	Fish.	Days.	Fish.	Days.	Fish.	Days.	Fish.	Days.
July 21	2	8.0								
22	1	2.0	5	2.0					1	15.0
23	6	1.8	4	5.5	1	2.0	2	4.5		
24	3	1.0	2	6.5	1	1.0	3	3.0	1	8.0
25			1	14.0			2	1.0		
26	12	3.0					2	4.0	3	5.3
28	7	2.0	3	3.7			1	3.0	2	3.0
30							1	1.0	2	5.5
31	4	2.5	3	2.7			1	2.0	5	3.2
Aug. 1	5	1.6	2	3.5	2	3.0	9	1.4	5	5.0
2	5	2.2	1	12.0					3	3.0
4	4	1.2	6	3.3			3	2.0	8	2.5
5			2	2.5			1	2.0	4	3.7
7									1	2.0
Total	49		29		4		25		35	
Average [b]		2.4		4.2		2.2		2.3		4.4

Date marked.	8		9		10		Total marked.	Total returned.	Percentage returned.
	Fish.	Days.	Fish.	Days.	Fish.	Days.			
July 21			1	3.0	2	4.5	25	5	20
22	2	5.0	1	2.0			40	10	25
23	1	3.0	5	3.6	8	4.4	95	27	28
24			3	2.7	4	5.7	56	17	30
25	2	7.5			7	11.7	50	12	24
26	5	8.0	10	7.5	11	3.5	111	43	39
28	3	5.7	7	5.7	4	4.0	54	27	50
30							17	3	18
31	6	3.0					48	19	40
Aug. 1	14	4.4	3	3.0	5	7.0	104	45	43
2	7	5.1	5	3.4	3	8.0	64	24	38
4	9	3.4	6	8.0	6	8.7	94	42	45
5	4	3.5	5	6.2	1	7.0	42	17	41
7	3	3.3	3	5.0	3	7.3	36	10	28
Total	56		49		54		836	301	36
Average [b]		4.6		5.4		6.3			

[a] No specimens marked at station B were recovered in regions 3 and 5.
[b] Weighted mean.

TABLE 8.—DISTRIBUTION OF RETURNS FROM MARKING AT STATION B ACCORDING TO REGION IN WHICH CAPTURED AND NUMBER OF DAYS EN ROUTE.[a]

Days en route.	1	2	4	6	7	8	9	10
1	20	2	2	13	4	1	1	2
2	15	13	1	4	9	6	10	2
3	6	4	.....	4	7	21	13	8
4	1	2	.....	.....	6	8	9	14
5	3	1	1	2	1	8	4	14
6	1	.....	.....	2	2	5	2	5
7	.....	1	.....	.....	1	2	2	1
8	3	1	.....	.....	2	1	.....	.....
9	.....	2	.....	.....	.....	.....	.....	1
10	.....	1	.....	.....	1	1	1	.....
11	.....	.....	.....	.....	1	1	.....	1
12	.....	1	.....	.....	.....	1	1	.....
13	.....	.....	.....	.....	.....	.....	2	1
14	.....	1	.....	.....	.....	.....	1	.....
15	.....	.....	.....	.....	1	.....	.....	2
16	.....	.....	.....	.....	.....	.....	1	1
19	.....	.....	.....	.....	.....	.....	1	.....
23	.....	.....	.....	.....	.....	1	.....	.....
25	.....	.....	.....	.....	.....	.....	.....	1
27	.....	.....	.....	.....	.....	.....	1	1
Total	49	29	4	25	35	56	49	54

[a] No specimens marked at station B were recovered in regions 3 and 5.

TABLE 9.—NUMBER AND PERCENTAGE OF SPECIMENS FROM EACH DAY'S MARKING AT STATION C TAKEN IN EACH REGION AND AVERAGE NUMBER OF DAYS EN ROUTE, 1918.[a]

Date marked.	1		2		3		4		6		7	
	Fish.	Days.	Fish.	Days.	Fish.	Days.	Fish.	Days.	Fish.	Days.	Fish.	Days.
July 17	4	5.2	.....	.....	.....	.....	3	4.3	.....	.....	2	4.5
19	.....	.....	5	2.8	1	3.0	.....	.....	5	6.2	3	3.3
22	4	3.0	2	2.5	.....	.....	.....	.....	1	2.0	1	1.0
24	3	4.3	4	10.0	1	7.0	.....	.....	3	6.3	.....	.....
26	5	3.2	6	5.5	.....	.....	.....	.....	3	7.6	6	9.0
Aug. 6	.....	.....	1	1.0	.....	.....	.....	.....	.....	.....	1	5.0
7	1	2.0	2	1.5	.....	.....	1	6.0	1	9.0	1	2.0
9	1	2.0	2	2.5	.....	.....	.....	.....	4	6.2	2	3.5
13	4	2.0	5	1.4	.....	.....	1	3.0	.....	.....	2	6.0
14	1	3.0	7	2.1	.....	.....	.....	.....	1	2.0	3	5.0
Total	23	.....	34	.....	2	.....	5	.....	18	.....	21	.....
Average [b]	.....	3.0	.....	3.8	.....	5.0	.....	4.4	.....	6.2	.....	5.5

Date marked.	8		9		10		Total marked.	Total returned.	Percentage returned.
	Fish.	Days.	Fish.	Days.	Fish.	Days.			
July 17	1	3.0	2	6.0	1	4.0	43	13	30.0
19	4	6.0	1	3.0	.....	.....	50	19	38.0
22	3	5.0	3	6.3	2	13.5	61	16	26.0
24	3	6.3	4	6.5	5	8.6	76	23	30.0
26	13	6.6	7	8.0	7	11.4	152	47	33.0
Aug. 6	.....	.....	.....	.....	.....	.....	164	2	1.0
7	6	5.0	1	5.0	1	7.0	118	14	12.0
9	10	5.5	5	6.2	1	9.0	105	25	24.0
13	7	3.0	5	5.8	.....	.....	155	24	15.5
14	1	6.0	.....	.....	3	13.0	76	16	21.0
Total	48	.....	28	.....	20	.....	1,000	199	19.9
Average [b]	.....	5.4	.....	6.5	.....	10.4	.....	.....	.....

[a] No specimens marked at station C were taken in region 5.
[b] Weighted mean.

TABLE 10.—DISTRIBUTION OF RETURNS FROM MARKING AT STATION C ACCORDING TO REGION IN WHICH CAPTURED AND NUMBER OF DAYS EN ROUTE.[a]

Days en route.	1	2	3	4	6	7	8	9	10
1	3	8				1			
2	6	9			2	2	4		
3	7	7	1	1	2	4	11	2	
4	1	1		2	1	2	11	7	3
5	3	1		1	7	4	5	5	2
6		3		1		3	8	3	2
7	2	1	1		2	1	2	3	2
8	1	1					2	4	
9					1	2	2	1	2
10						1		1	2
11		1			1				1
12									1
13		1						1	
14					2		1		1
15		1							
16							1		
17						1			
19									1
21								1	1
23							1		2
Total	23	34	2	5	18	21	48	28	20

[a] No specimens marked at station C were recovered in region 5.

TABLE 11.—NUMBER AND PERCENTAGE OF SPECIMENS FROM EACH DAY'S MARKING AT STATION D TAKEN IN EACH REGION AND AVERAGE NUMBER OF DAYS EN ROUTE, 1918.[a]

Date marked.	1		2		7		8		9		10		Total number marked.	Total number returned.	Percentage returned.
	Fish.	Days.	Fish.	Days.	Fish.	Days.	Fish.	Days.	Fish.	Days.	Fish.	Days.			
July 19					2	4.0	16	5.1	8	4.6	1	3.0	85	27	32
23							17	1.9	4	1.5	3	10.3	92	24	26
24							3	2.0	15	3.8	5	10.2	74	23	31
28	2	1.0					9	1.4	12	2.8	4	15.7	63	27	43
30			1	3.0			5	2.2	4	1.7	4	2.0	46	14	30
Aug. 2					1	3.0	6	2.5	10	2.8	3	12.3	56	20	36
4					5	1.0	19	1.6	9	1.6	2	22.5	61	35	57
5							23	1.6	8	1.9	3	8.0	78	34	44
6					2	5.0	18	2.8	24	2.3	6	3.2	94	50	53
7							10	1.8	9	2.2	1	5.0	41	20	49
9					1	10.0	5	3.8	6	4.0	3	3.7	47	15	32
Total	2		1		11		131		109		35		737	289	39
Average [b]		1.0		3.0		3.3		2.5		2.7		8.5			

[a] No specimens marked at station D were recovered in regions 3, 4, 5, and 6. [b] Weighted mean.

TABLE 12.—DISTRIBUTION OF RETURNS FROM MARKING AT STATION D ACCORDING TO REGION IN WHICH CAPTURED AND NUMBER OF DAYS EN ROUTE.[a]

Days en route.	1	2	7	8	9	10
1	2		5	47	28	2
2				39	38	1
3		1	2	28	19	12
4				6	10	2
5			3	4	7	5
6				3	2	
7				1	1	1
8				1		
9					1	
10			1		1	1
11					1	2
12						1
13					1	
15						2
18				1		1
20						1
21				1		1
23						1
30						1
33						1
Total	2	1	11	131	109	35

[a] No specimens marked at station D were recovered in regions 3, 4, 5, and 6.

TABLE 13.—NUMBER AND PERCENTAGE OF SPECIMENS FROM EACH DAY'S MARKING AT STATION E TAKEN IN EACH REGION AND AVERAGE NUMBER OF DAYS EN ROUTE, 1918.[a]

Date marked.	6		7		8		9		10		Total marked.	Total returned.	Percentage returned.
	Fish.	Days.	Fish.	Days.	Fish.	Days.	Fish.	Days.	Fish.	Days.			
July 25	.....	.....	1	11.0	.....	.....	.....	.....	5	3.4	95	6	6
26	.....	.....	.....	.....	.....	.....	.....	.....	10	3.7	70	10	14
29	.....	.....	.....	.....	3	3.7	2	3.5	9	5.0	93	14	15
30	.....	.....	.....	.....	3	4.0	5	7.4	19	5.5	114	27	23
31	.....	.....	2	7.5	5	7.8	5	3.4	27	8.3	122	39	32
Aug. 1	.....	.....	.....	.....	.....	.....	1	11.0	13	9.3	39	14	36
2	.....	.....	.....	.....	2	8.5	4	5.2	14	4.9	97	20	21
5	1	4.0	1	6.0	.....	.....	5	8.6	19	9.8	113	26	23
6	.....	.....	.....	.....	.....	.....	3	4.7	22	7.9	75	25	33
7	.....	.....	.....	.....	.....	.....	1	2.0	4	2.7	16	5	31
8	.....	.....	.....	.....	1	10.0	1	4.0	9	3.4	118	11	10
15	.....	.....	.....	.....	.....	.....	.....	.....	3	10.0	56	3	5
16	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	12	.....	.....
19	.....	.....	.....	.....	.....	.....	.....	.....	2	2.0	23	2	8
20	.....	.....	.....	.....	.....	.....	.....	.....	7	4.7	31	7	23
21	.....	.....	.....	.....	.....	.....	.....	.....	3	2.7	16	3	19
Total	1	.....	4	.....	14	.....	27	.....	166	.....	1,090	212	19.5
Average[b]	.....	4.0	.....	8.0	.....	6.4	.....	5.8	.....	6.7	.....	.....	.....

[a] No specimens marked at station E were recovered in regions 1, 2, 3, 4, and 5. [b] Weighted mean.

TABLE 14.—DISTRIBUTION OF RETURNS FROM MARKING AT STATION E ACCORDING TO REGION IN WHICH CAPTURED AND NUMBER OF DAYS EN ROUTE.[a]

Days en route.	6	7	8	9	10	Days en route.	6	7	8	9	10
1	.....	.....	.....	3	34	15	.....	.....	.....	2	4
2	.....	.....	.....	1	25	16	.....	.....	1	.....	2
3	.....	.....	2	3	24	17	.....	.....	.....	.....	1
4	1	1	3	4	10	18	.....	.....	.....	.....	2
5	.....	.....	3	6	7	20	.....	.....	.....	.....	3
6	.....	1	1	2	12	21	.....	.....	.....	.....	3
7	.....	.....	2	2	10	24	.....	.....	.....	.....	2
8	.....	.....	.....	.....	4	26	.....	.....	.....	.....	1
9	.....	.....	.....	2	3	27	.....	.....	.....	.....	1
10	.....	.....	2	.....	3	30	.....	.....	.....	.....	2
11	.....	2	.....	2	3	31	.....	.....	.....	.....	1
12	.....	.....	.....	.....	3	32	.....	.....	.....	.....	2
13	.....	.....	.....	.....	2						
14	.....	.....	.....	.....	2	Total	1	4	14	27	166

[a] No specimens marked at station E were recovered in regions 1, 2, 3, 4, and 5.

It was hoped that much more detailed information as to the migration up the Fraser River might be presented, and to that end the river and the waters of the Strait of Georgia around the mouth of the river had been divided into 20 regions, each comprising about 5 miles of the river or offshore about the mouths. The returns from Canada were at first studied on this basis, but it finally became clear that the subdivisions were much too small to give results of any significance. These 20 regions were then combined into 7, as follows:

Region 10. Banks off the mouth of the south arm and Canoe Pass.
Region 11. South arm and Canoe Pass up as far as Deas Island.
Region 12. South arm from Deas Island to New Westminster.
Region 13. Banks off the mouth of the north arm.
Region 14. North arm.
Region 15. Fraser River from New Westminster to the mouth of Pitt River.
Region 16. Fraser River from the mouth of Pitt River to Mission Bridge.

Table 15 gives the number of specimens, which were marked at each of the marking stations, recovered from each of these regions, and the average number of days en route. It is apparent from this that even with this increase in the size of the regions no significant and consistent difference in the length of time required to reach the different regions appears, and for the purposes of statistical analysis it was necessary to consider all of the returns from the main Canadian waters as constituting a single group, and to combine regions 10 to 16 into one region, 10. It is much to be regretted that the data are not such as to make possible a reliable estimate of the rate of travel in the river itself. Whether this is due to the manner of collecting and recording the data can not be stated. Although these records from Canadian waters do not admit of detailed analysis, when combined as a single group they agree well with the results obtained from American waters.

TABLE 15.—NUMBER OF SPECIMENS MARKED AT EACH STATION RECOVERED IN EACH REGION IN CANADIAN WATERS, INCLUDING THE FRASER RIVER TO MISSION BRIGDE ONLY, AND AVERAGE NUMBER OF DAYS EN ROUTE.

	Station.					Total fish.	Average number days en route.[a]
	A.	B.	C.	D.	E.		
Region 10:							
Fish	3	15	7	11	35	71	.....
Days	7.0	6.3	10.3	8.0	6.8	.....	7.2
Region 11:							
Fish	8	27	8	15	77	135	.....
Days	13.5	6.0	6.9	9.1	6.1	.....	6.9
Region 12:							
Fish	2	5	2	3	11	23	.....
Days	6.5	5.6	13.5	12.3	5.2	.....	7.0
Region 13:							
Fish	.....	.....	.....	3	11	14	.....
Days	.....	.....	.....	2.7	9.9	.....	8.4
Region 14:							
Fish	.....	1	.....	1	18	20	.....
Days	.....	5.0	.....	1.0	6.8	.....	6.4
Region 15:							
Fish	.....	2	2	2	4	10	.....
Days	.....	5.5	14.5	3.0	9.7	.....	8.5
Region 16:							
Fish	1	4	1	.....	10	16	.....
Days	5.0	7.8	10.0	.....	6.0	.....	6.6
Total fish	14	54	20	35	166	289	.....
Average number days en route[a]	10.5	6.3	10.4	8.5	6.7	.....	7.1

[a] Weighted mean.

In Table 16 is shown the total number of individuals marked at each station which were taken in each region, together with the average time en route. This combines the totals and averages developed in Tables 5 to 14.

TABLE 16.—NUMBER OF SPECIMENS MARKED AT EACH STATION TAKEN IN EACH REGION AND AVERAGE NUMBER OF DAYS EN ROUTE.[a]

	1		2		3		4		6	
	Fish.	Days.	Fish.	Days.	Fish.	Days.	Fish.	Days.	Fish.	Days.
A	12	2.8	16	4.1	.....	.....	1	2	23	5.7
B	49	2.4	29	4.2	.....	.....	4	2.2	25	2.3
C	23	3.0	34	3.8	2	5.0	5	4.4	18	6.1
D	2	1.0	1	3.0	.....	.....	.....	.....	.....	.....
E	.....	.....	.....	.....	.....	.....	.....	.....	1	4.0
Total	86	.....	80	.....	2	.....	10	.....	67	.....

	7		8		9		10		Total.
	Fish.	Days.	Fish.	Days.	Fish.	Days.	Fish.	Days.	
A	32	5.8	25	7.5	13	7.2	14	10.5	136
B	35	4.4	56	4.6	49	5.4	54	6.3	301
C	21	5.5	48	5.4	28	6.5	20	10.4	199
D	11	3.3	131	2.5	109	2.7	35	8.5	289
E	4	8.0	14	6.4	27	5.8	166	6.7	212
Total	103	.....	274	.....	226	.....	289	.....	1,137

[a] No specimens were taken in region 5.

ROUTES TAKEN BY FRASER RIVER SOCKEYES THROUGH PUGET SOUND.—Tables 17 and 18 show in complementary ways the distribution of returned fish according to the station at which they were marked and the region in which they were taken. Table 17 gives the percentages of the total returns from each station which were taken in each region; and Table 18, the percentages of the total returns from each region which were marked at each station. The returns from regions 3, 4, and 5 are practically negligible. It is quite obvious that the great majority of the fish, on entering the Sound through the Strait of Juan de Fuca, pass across to Washington Sound, and especially the southern shores of the southern islands of the San Juan Archipelago (region 1) and the western shore of Whidbey Island (region 2); 8.8 per cent of the returned fish which were marked at Sooke were taken in region 1 and 11.8 per cent in region 2.

TABLE 17.—PERCENTAGES OF TOTAL FISH RECOVERED FROM EACH MARKING STATION WHICH WERE TAKEN IN EACH REGION.[a]

	1	2	3	4	6	7	8	9	10
A	8.8	11.8	.....	0.7	17.0	23.5	18.4	9.5	10.3
B	16.2	9.6	.....	1.3	8.3	11.6	18.6	16.2	17.9
C	11.5	17.0	1	2.5	9.0	10.5	24.1	14.0	10.0
D	.7	.4	.....	.....	.....	3.8	45.3	37.7	12.1
E	.....	.....	.....	.....	.5	1.9	6.6	12.7	78.3

[a] No specimens were recovered in region 5.

TABLE 18.—PERCENTAGES OF TOTAL FISH RECOVERED FROM EACH REGION WHICH WERE MARKED AT EACH STATION.[a]

	1	2	3	4	6	7	8	9	10
A	14.0	20.0	.....	10	34.3	31.0	9.1	5.8	4.8
B	57.0	36.2	.....	40	37.3	33.9	20.4	21.6	18.6
C	26.7	42.5	100	50	26.8	20.4	17.5	12.4	6.9
D	2.3	1.3	.....	.....	.....	10.7	47.8	48.3	12.1
E	.....	.....	.....	.....	1.5	3.8	5.1	11.9	57.4

[a] No specimens were recovered in region 5.

There is apparently considerable interchange of fish between regions 1 and 2, as is evidenced by the fact that 9.6 per cent of the returned fish marked at station B, located in region 1, were taken in region 2, and that 11.5 per cent of the fish marked at station C, in region 2, were taken in region 1. From the region of Washington Sound a very few fish pass northward through Haro Strait (region 4), but the proportion must be small compared with those passing through Rosario Strait and on up through the Strait of Georgia. The apparent proportions may, however, be modified by the fact that there are many more traps in Rosario Strait than in Haro Strait. The few fish taken in Haro Strait came from stations A, B, and C, as would be expected. Only two specimens were taken in Deception Pass, both marked at station C. No fish are recorded as having been taken in the central channels of the San Juan Archipelago.

From the southern part of the Strait of Georgia (locally designated the Gulf of Georgia) the fish pass Point Roberts and enter Canadian territorial waters. Very soon thereafter they must enter the river, especially through Canoe Pass and the main mouth of the south arm, and begin their journey up the river to the spawning grounds.

In summarizing, the route followed by the very great majority of the salmon entering the Strait of Juan de Fuca and bound for the Fraser River may be stated as follows: Across Washington Sound to the "Banks" south of the San Juan Islands and to the western shore of Whidbey Island; from there northward through Rosario Strait and the southern part of the Strait of Georgia, past Point Roberts to the mouths of the Fraser River. There is no evidence to indicate that this route is varied in different parts of the season.

As might be expected, this route is well indicated by the location of the various trap sites. The approximate number of traps in the various regions of Puget Sound for which licenses were issued in 1918 is as follows:[a]

Region 1	14	Region 7	11
Region 2	20	Region 8	40
Region 3	13	Region 9	39
Region 4	11		
Region 5	4	Total	178
Region 6	26		

In addition to the above there are 6 traps located on the Canadian side of the Straits of Juan de Fuca, on Vancouver Island, 11 scattering traps along the southern shore of these straits, and 29 in Ad-

[a] Based upon licenses issued by the Fish and Game Commission of the State of Washington.

miralty Straits, chiefly between Admiralty Bay and Double Bluff. There are also a few in Hood Canal and that part of the Sound extending south past Seattle, Saratoga Passage, and Padilla Bay. The ones listed above are those of chief concern here.

Little if any correlation between the number of traps and the number of marked fish taken in any particular region can be shown. In Table 19 the six regions from which most of the returns came have been arranged in the order of the number of traps located in each. Then is given, for each region, the percentages of fish marked at stations A and B which were recaptured in the respective regions. The other stations were not similarly treated, since only from these two did the fish pass through nearly all regions. Although no correlation is apparent here we would expect such a correlation to appear if sufficient data were available.

TABLE 19.—NUMBER OF TRAPS IN VARIOUS REGIONS AND NUMBER OF MARKED FISH TAKEN IN THOSE REGIONS.

Region.	Number of traps.	Percentage of returns from stations—	
		A.	B.
7	11	3.85	4.18
1	14	1.44	5.86
2	20	1.92	3.46
6	26	2.76	2.99
9	39	1.56	5.86
8	40	3.00	6.69

In a few instances a retrograde migration has apparently taken place, and the fish have traveled away from rather than toward the mouth of the Fraser River. It is possible that faulty data may account for this, especially in such extreme cases as those fish marked at station D and reported taken in regions 1 and 2; or it may be that these are not Fraser River fish, but are sockeyes bound for some other stream.

RATE OF MIGRATION.—A number of the preceding tables give, variously grouped, the average number of days required to pass from each marking station to each region. Tables 5, 7, 9, 11, and 13 show the total range of variation in this regard for each station, and the general averages for each station are shown in Table 16. From the last-mentioned table it is apparent that, as would be expected, the time en route usually increases as the distance between the station and the regions where the fish were recovered increases. Those fish which were captured in the same region in which they were marked—such, for instance, as were marked at station B and recovered from region 1—have evidently been slow to resume the migration after the marking. Forty-nine specimens marked at station B were taken in region 1 after being out an average of 2.4 days. From station C, 34 specimens were taken in region 2 after an interval of 3.8 days. Eleven specimens from station D were taken in region 7 after an average of 3.3 days, and 27 specimens from station E were taken in region 9 after 5.8 days. It seems quite clear

that, in the case of fish which have been recaptured comparatively close to the point at which they were liberated, the rate of progress is slower than that of fish taken a greater distance from the marking station. Also, as may be seen from Table 16, in cases where a retrograde migration has taken place the rate of progress has usually been slow. These occurrences may possibly be due to some slight injury, or other unfavorable result, due to the handling attendant upon tagging. It may also be due to inaccurate data. In either case it would seem justifiable, when estimating the normal rate of progress through the Sound, to consider only those cases of forward migration in which the fish have traveled a reasonably long distance from the station at which they were marked, say not less than 20 miles.

In the case of the Canadian records it will be noted that the correlation between the distance traveled and the time en route is very low. The average time required to pass from station E, at Point Roberts, into the Fraser River is 6.7 days. This would indicate a much slower rate of migration here than in other parts of the Sound. In order to throw additional light upon this point, the difference between the time required for fish marked at stations A, B, C, and D to reach the vicinity of Point Roberts (region 9) and that which elapsed before the fish from these same stations were taken in Canadian waters has been calculated as follows:

	Days.
Station A	3.3
Station B	.9
Station C	3.9
Station D	5.8
Average (simple mean)	3.47

This indicates a rate of progress between Point Roberts and the Fraser River almost twice as rapid as that indicated solely by the results of the marking at Point Roberts, and one agreeing much better with the results obtained from the American records.

The previous tables have shown the rate of travel as the number of days required to pass from the marking station to the various regions of the Sound. In order to make these figures comparable, the rate in miles per day has been calculated for each instance. This has been done by simply dividing the distance traveled by the time required to make the journey. Table 20 gives the distances from each marking station to each of the established regions of the Sound. These distances were measured, by means of an ordinary map measure, from the marking station to approximately the center of the region in question. The most direct route possible was chosen.

TABLE 20.—DISTANCES IN PUGET SOUND FROM MARKING STATIONS TO REGIONS WHERE FISH WERE TAKEN.[a]

Station.	Region.	Miles.	Station.	Region.	Miles.	Station.	Region.	Miles.
A	1	35	C	1	15.5	E	1	62
	2	47.5		2	.....		2	59.5
	3	57		3	15.5		3	62.5
	4	45		4	35		4	35
	5	52.5		5	23.5		5	35
	6	60		6	20		6	45
	7	71		7	33		7	35
	8	83		8	45		8	20.5
	9	92.5		9	59.5		9	.....
	10	122.5		10	89.5		10	30
B	1	.....	D	1	33.5			
	2	15		2	28			
	3	21.5		3	29.5			
	4	17.5		4	51.5			
	5	10		5	41.5			
	6	21.5		6	13			
	7	33.5		7	.....			
	8	47.5		8	11.5			
	9	62		9	27.5			
	10	92		10	57.5			

[a] As it is obvious that the majority of the fish pass through Rosario Straits, the distances, wherever applicable, have been measured over this route.

TABLE 21.—NUMBER OF SPECIMENS MARKED AT EACH STATION TAKEN IN EACH REGION AND RATE OF PROGRESS IN MILES PER DAY.[a]

	A.	B.	C.	D.	E.		A.	B.	C.	D.	E.
Region 1:						Region 7:					
Fish	12	49	23	2	.....	Fish	32	35	21	11	4
Rate	12.5	.....	5.2	33.5	.....	Rate	12.2	7.6	6.0	.....	4.4
Region 2:						Region 8:					
Fish	16	29	34	1	.....	Fish	25	56	48	131	14
Rate	11.5	3.6	.....	9.3	.....	Rate	11.1	10.3	8.3	4.6	3.2
Region 3:						Region 9:					
Fish	.....	.....	2	.....	.....	Fish	13	49	28	109	27
Rate	.....	.....	3.1	.....	.....	Rate	12.8	11.5	9.1	10.2	.....
Region 4:						Region 10:					
Fish	1	4	5	.....	.....	Fish	14	54	20	35	166
Rate	22.5	8.0	8.0	.....	.....	Rate	11.7	14.6	8.6	6.8	4.5
Region 6:											
Fish	23	25	18	.....	1						
Rate	10.5	9.3	3.3	.....	11.2						

[a] No specimens were taken in region 5.

Table 21 gives the results of these calculations of the rate in miles per day, together with the number of individuals on which the calculations are based. From this has been calculated the mean rate of travel.[a] In doing this all cases have been omitted which were based on (1) less than 10 individuals, (2) a distance traveled of less than 20 miles, and (3) a retrograde migration relative to the mouth of the Fraser River. This has been done to exclude, as nearly as possible, all abnormal figures. With these exclusions there remain 19 categories on which to base the final conclusions as to the rate of migration. The data for these 19 categories are given separately in the following table:

[a] For this and other similar means the "harmonic mean" recommended by Yule (An Introduction to the Theory of Statistics), Rugg (Statistical Methods Applied to Education), and others, for the calculation of mean rates based on units of work, has been used. The harmonic mean is defined by Rugg as "the reciprocal of the arithmetic mean of the reciprocals of the individual measures of the series."

TABLE 22.—RATE OF PROGRESS IN THE 19 CATEGORIES CONTAINING THE MOST RELIABLE DATA.

Station marked.	Region where captured.	Distance traveled.	Specimens.	Rate per day.
		Miles.	*Number.*	*Miles.*
A	1	35	12	12.5
	2	47.5	16	11.5
	6	60	23	10.5
	7	71	32	12.2
	8	83	25	11.1
	9	92.5	13	12.8
	10	122.5	14	11.7
B	6	21.5	25	9.3
	7	33.5	35	7.6
	8	47.5	56	10.3
	9	62	49	11.5
	10	92	54	14.6
C	7	33	20	6.0
	8	45	48	8.3
	9	59.5	28	9.1
	10	89.5	20	8.6
D	9	27.5	109	10.2
	10	57.5	35	6.8
E	10	30	166	4.5

Calculated from these figures the mean rate of migration is 7.8 miles per day. If the Canadian records are omitted, the rate is 9.7 miles per day.

Greene,[a] in his study of the migration of salmon (chinook, silver salmon, and steelhead) in the Columbia River, obtained results quite different from these. He estimates that from 30 to 40 days are usually required for the process of acclimatization to fresh water, during which time the fish work back and forth with the tides. After entering water which is wholly fresh he estimates the rate of travel of silver salmon and steelhead at 6.36 to 7.50 miles per day, although he concedes that this is only about one-third of the rate of travel as estimated by men engaged in the fishing industry and seems to imply that their figures are probably more reliable than his own. Greene's figures should be accepted with considerable caution on account of the comparatively few individuals marked and the fact that three species were represented and all combined to give his final results. The sockeye tagging experiment has produced no evidence indicating that the migration is especially retarded during the passage from salt to fresh water. As may be seen from Table 15, there is no great difference in the time required to pass from American waters to the Fraser River, just within the mouths, and that required to pass above New Westminister, where the water is entirely fresh. Furthermore, as will be seen later, in the case of fish taken on or near the spawning grounds in the tributaries, the time elapsed since marking averages between 30 and 40 days, the time given by Greene as required for the process of acclimatization. It may be concluded either that Greene's results are wholly unreliable or that the migration of sockeye is quite different from that of the species studied by him, which is, of course, entirely possible. The rate of migration of the quinnat (chinook) salmon of the Sacramento River as given by Rutter[b] is much more nearly in accord with the results of this sockeye study. He estimates

[a] Greene, Charles W.: The migration of salmon in the Columbia River. Bulletin U. S. Bureau of Fisheries for 1909, Vol. XXIX, pp. 129–148. Washington, 1911.

[b] Rutter, Cloudsley: Natural history of the quinnat salmon. Bulletin U. S. Fish Commission for 1902, Vol. XXII, pp. 65–142. Washington, 1903.

the rate of progress through brackish water to average 7 or 8 miles per day and that through fresh water to be between 15 and 20 miles per day. These figures apply only to the spring run on the Sacramento River. The migration of the fall run is considerably slower, averaging but 4 to 5 miles per day through the fresh water. Greene's observations were, of course, made upon fall run fish.

A further analysis of data has shown some interesting variations in the rate of migration. A calculation of the mean rate of migration from each marking station indicates that the rate of travel decreases as the fish approach nearer the mouth of the Fraser River as follows: Station B, 10.5; station C, 7.9; station D, 9.1; station E, 4.5.

Finally the rates of migration for different parts of the season have been calculated. Data given in Tables 1 and 2 were first condensed into quartiles and then into halves, and the rate of travel in miles per day was calculated for each of these. The positions of the quarter points determining the quartiles were based on the number of fish marked, not on the number returned. In adopting a central point on which to separate the halves it was rather arbitrarily determined to consider all fish marked during July as belonging to the first half and all those marked during August as belonging to the second half. It is more convenient to think of the halves as separated in this manner, and the central point separating the fish marked into halves comes sufficiently close to the 1st of August to warrant the division on this basis. These calculations have not been made for stations C and E nor for any cases based on less than 10 individuals or showing a retrograde migration relative to the mouth of the Fraser River. The inaccuracies in the marking record at station C would have made such treatment valueless. In the case of station E, over 78 per cent of the fish recovered were taken in Canadian waters. Inasmuch as the authors were unable to make a detailed analysis of the Canadian records, it has seemed best not to attempt too detailed an analysis of the records obtained from the marking at station E.

TABLE 23.—RATE IN MILES PER DAY IN DIFFERENT QUARTILES—RETURNS FROM STATION A, BY REGIONS.

Quartiles.	1		2		6		7		8		9		10		Total fish.	Average rate.[a]
	Fish.	Rate.	Fish.	Rate.	Fish.	Rate.	Fish.	Rate.	Fish.	Rate.	Fish.	Rate.	Fish.	Rate.		
First	6	9.2	8	12.2	6	13.9	3	11.3	2	10.4	5	22.0	5	19.1	35	13.0
Second	3	35.0	2	6.8	9	8.6	8	9.9	4	9.8	5	9.2	2	18.8	33	10.0
Third	1	11.6	4	12.8	6	12.5	13	11.4	13	10.0	2	11.6	5	10.4	44	11.1
Fourth	2	14.0	2	15.8	2	15.0	8	19.7	6	17.3	1	13.2	2	5.7	23	14.5

[a] Harmonic mean.

TABLE 24.—RATE IN MILES PER DAY IN DIFFERENT HALVES—RETURNS FROM STATION A, BY REGIONS.

Halves.	1		2		6		7		8		9		10		Total fish.	Average rate.[a]
	Fish.	Rate.	Fish.	Rate.	Fish.	Rate.	Fish.	Rate.	Fish.	Rate.	Fish.	Rate.	Fish.	Rate.		
First	0	12.1	11	10.3	18	9.8	19	9.7	15	8.9	10	13.0	10	13.6	92	10.5
Second	3	13.0	5	14.8	5	14.3	13	18.7	10	17.3	3	12.0	4	8.6	43	14.8

[a] Harmonic mean.

TABLE 25.—RATE IN MILES PER DAY IN DIFFERENT QUARTILES—RETURNS FROM STATION B, BY REGIONS.

Quartiles.	6		7		8		9		10		Total fish.	Average rate.[a]
	Fish.	Rate.	Fish.	Rate.	Fish.	Rate.	Fish.	Rate.	Fish.	Rate.		
First	4	5.1	2	2.9	3	11.0	10	20.0	14	18.4	33	11.0
Second	6	9.3	9	9.1	9	6.2	14	10.3	21	14.4	59	10.0
Third	11	14.3	9	7.7	25	11.3	7	12.6	6	14.6	58	11.3
Fourth	4	10.8	15	11.7	19	13.2	18	10.3	13	13.3	69	11.9

[a] Harmonic mean.

TABLE 26.—RATE IN MILES PER DAY IN DIFFERENT HALVES—RETURNS FROM STATION B, BY REGIONS.

Halves.	6		7		8		9		10		Total fish.	Average rate.[a]
	Fish.	Rate.	Fish.	Rate.	Fish.	Rate.	Fish.	Rate.	Fish.	Rate.		
First	12	7.7	14	6.6	19	8.8	27	12.1	36	16.1	108	10.5
Second	13	12.6	21	8.6	37	11.6	22	11.3	18	13.4	111	10.9

[a] Harmonic mean.

TABLE 27.—RATE IN MILES PER DAY IN DIFFERENT QUARTILES—RETURNS FROM STATION D, BY REGIONS.

Quartiles.	8		9		10		Total fish.	Average rate.[a]	Average rate (for regions 9 and 10 only).
	Fish.	Rate.	Fish.	Rate.	Fish.	Rate.			
First	33	3.7	13	8.1	5	6.7	51	4.6	7.6
Second	18	6.4	30	8.6	13	6.5	61	7.3	7.8
Third	46	6.8	27	13.1	7	3.9	80	7.5	8.8
Fourth	34	4.4	39	11.0	10	16.4	83	7.0	11.8

[a] Harmonic mean.

TABLE 28.—RATE IN MILES PER DAY IN DIFFERENT HALVES—RETURNS FROM STATION D, BY REGIONS.

Halves.	8		9		10		Total fish.	Average rate.[a]
	Fish.	Rate.	Fish.	Rate.	Fish.	Rate.		
First	50	4.3	43	8.3	17	6.2	110	5.6
Second	81	5.5	66	11.5	18	7.4	165	7.2

[a] Harmonic mean.

In the case of the quartiles, the indications are that the rate is more rapid in the first than in the second quartile, and that the rates in the third and fourth quartiles are successively more rapid than in the second. This does not appear clearly in the results from station D, especially when the returns from region 8 are included. Omitting the returns from region 8 (which is deemed legitimate, considering the comparatively short distance traveled, just 20 miles from station D to the center of region 8) brings the results more nearly in accord with those obtained from stations A and B, the only disagreement being in the rate during the first quartile. This is, in the case of station D, slightly less, rather than greater, than the rate in the second quartile.

It seems not unlikely that the difference in rates of travel shown in the different quartiles may be explained as indicating racial differences existing in the fish composing different parts of the run. Gilbert [a] has demonstrated that the Fraser River run is composed of a number of distinguishable races, each bound to a different spawning region. The assumption that these races may have different rates of migration while passing through the waters of the Sound does not seem to be a difficult one to accept.

In the case of the halves, the results from all three stations are in complete agreement, indicating that the rate during the second half is distinctly more rapid than during the first half.

In connection with the above determination of the rate of progress through Puget Sound, it must be borne in mind that the rates are undoubtedly lower than they should be. This necessarily follows when it is considered that seldom less than one day, and frequently three or four days, elapses between the times when the traps are lifted and the fish reported. Again, the fish may spend some time in the hearts and pot of the trap before entering the spiller, from which they may be taken at the next lift. A fish entering the trap immediately after it has been lifted would not be reported before the next day at the earliest, thus adding at least one day to the actual time required to make the journey from the marking station. If traps were uniformly lifted at 24-hour intervals, 12 hours could with safety be subtracted from the average number of days en route and the rate calculated accordingly. The authors' knowledge on this point, however, is not sufficient to warrant such treatment. It would undoubtedly be a step in the right direction, but would tend to give an opinion that the rates have been fully corrected, which would be quite unwarranted by the facts. It is possible that the error involved is within the limits of error dependent upon other factors.

RETURNS FROM TRIBUTARY STREAMS AND THE FRASER RIVER ABOVE MISSION BRIDGE.

Returns were obtained from various sections of the Fraser River watershed which have not been included in the regions indicated on the map. These sections may be indicated as follows:

	Specimens.
Main river, 3 to 27 miles above Mission	7
Main river, near Hope, Yale, Hell's Gate, and Spuzzum	16
Main river at Lytton and Lillooet	2
Main river at Soda Creek	2
Pitt River	6
Harrison Lake system, between Harrison and Lillooet Lakes	5
Harrison Lake system, Birkenhead River	9
Seton Lake system, Portage Creek	2
Chilcotin River	1

The complete data concerning these returns are given in Table 29. The mean dates on which the fish captured in each of the above districts were marked have been calculated and appear in the summary. This was done in order to see, if possible, when the fish bound to the different tributaries were to be found in Puget Sound. The possibility of a segregation in time of the races demonstrated by Dr. Gilbert has been suggested above.

[a] Gilbert, Charles H.: Contributions to the life history of the sockeye salmon. Report, commissioner of fisheries for the Province of British Columbia for 1917, paper No. 4, pp. Q33–80. Victoria, 1918.

TABLE 29.—RETURNS OF SPECIMENS MARKED AT EACH STATION FROM FRASER RIVER OTHER THAN THE MAIN RIVER FROM THE MOUTH TO MISSION BRIDGE, 1918.

Section.	A.			B.			C.			D.			E.			Summary.		
	Date marked.	Date taken.	Days en route.	Date marked.	Date taken.	Days en route.	Date marked.	Date taken.	Days en route.	Date marked.	Date taken.	Days en route.	Date marked.	Date taken.	Days en route.	Fish taken.	Mean date marked.	Average days en route.
3-27 miles above Mission, main river				July 26	July 31	5	July 17	Aug. 17	31				July 29	Aug. 5	6	7	July 27	9.3
													...do...	Aug. 7	9			
													Aug. 2	Aug. 5	3			
													...do...	Aug. 7	5			
Near Hope, Yale, Spuzzum, and Hell's Gate, main river	July 21	Aug. 1	11	Aug. 1	Aug. 5	4				July 23	Aug. 2	10	July 25	July 29	4	16	July 30	16.3
	...do...	Aug. 26	36	Aug. 4	Aug. 16	12				July 28	Aug. 26	29	...do...	Aug. 5	11			
										Aug. 6	Aug. 16	10	July 26	...do...	10			
										Aug. 7	Sept. 16	40	July 29	Aug. 16	18			
													July 30	Aug. 9	10			
													July 31	Aug. 28	28			
													Aug. 2	Aug. 13	11			
													Aug. 7	Aug. 16	9			
													Aug. 8	Aug. 19	11			
Lytton and Lillooet Bridge, main river										July 30	Aug. 30	31	July 30	Aug. 30	31	2	...do...	31.0
Soda Creek, main river				July 25	Aug. 27	33				July 19	Aug. 16	28				2	July 22	30.5
Pitt River, 5 miles above Pitt Lake				July 24	Sept. 15	53										6	Aug. 3	38.5
				July 26	...do...	51				Aug. 6	Sept. 19	44						
				July 31	Aug. 30	30				Aug. 9	Sept. 4	26						
				Aug. 7	Sept. 3	27												
Between Harrison and Lillooet Lakes	July 27	Sept. 14	49										July 30	Aug. 20	21	5	Aug. 2	31.0
													...do...	Aug. 27	28			
													Aug. 2	Sept. 11	40			
													Aug. 16	Sept. 2	17			
Harrison and Lillooet Lakes, Birkenhead River				Aug. 4	Sept. 17	44				Aug. 5	Sept. 20	46	July 30	Sept. 14	46	9	Aug. 10	41.4
				Aug. 5	Sept. 20	46							Aug. 15	Sept. 15	31			
													...do...	Sept. 20	36			
													...do...	Sept. 21	37			
													...do...	Sept. 24	40			
													Aug. 21	Oct. 7	47			
Seton and Anderson Lakes, Portage Creek													July 29	Sept. 12	45	2	July 30	43.0
													July 31	Sept. 10	41			
Chilcotin River													July 30	Sept. 13	45	1	...do...	45.0
Total																50		

The data here presented are quite too fragmentary to afford a basis for more than the most tentative conclusions; but the following points are suggested:

1. The fish which go farthest up the main river before turning into the tributary in which they are to spawn run earlier in the season.

2. The main bulk of the fish which pass up the main river past Hope are to be found in Puget Sound at the height of the season, the latter part of July and early in August.

3. The fish entering the lower tributaries, Pitt River and the Harrison Lake system, come largely from those fish constituting the last half of the run.

In the event that it were deemed desirable to stop commercial fishing for part of the season, it would seem that the first part should be selected, as the indications are that there is a larger proportion of the upriver fish in the first half of the run, and these are the fish which have suffered more severely as a result of the disaster of 1913.

SUMMARY.

1. The experiment of tagging adult sockeye salmon in Puget Sound was initiated in an effort to determine the routes and rates of migration of Fraser River sockeyes in passing through the waters where commercial fishing is permitted.

2. During July and August, 1918, numbered silver or aluminum buttons were attached to 4,494 adult sockeyes. Of these 1,199 were later recovered and data as to time and place of capture secured.

3. The route most commonly followed passes from the Strait of Juan de Fuca across Washington Sound to the Salmon Banks and Whidbey Island, then through Rosario Strait and the southern part of the Strait of Georgia, past Point Roberts to the mouths of the Fraser River.

4. The rate of migration as determined by the data for American waters is approximately 10 miles per day.

5. The migration is more rapid during the last half than during the first half of the season.

FISHES IN RELATION TO MOSQUITO CONTROL IN PONDS

By Samuel F. Hildebrand
Superintendent, U. S. Fisheries Biological Station
Key West, Fla.

Appendix IX to the Report of the U. S. Commissioner of Fisheries for 1918

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FISHES IN RELATION TO MOSQUITO CONTROL IN PONDS.[a]

By Samuel F. Hildebrand,
Superintendent, U. S. Fisheries Biological Station, Key West, Fla.

INTRODUCTION.

The United States Commissioner of Fisheries, in response to a request from the United States Public Health Service for an ichthyologist, detailed the writer to cooperate with the public health authorities of the extra-cantonment zone of Camp Hancock, Augusta, Ga., in an antimalarial campaign. The duty assigned to the author was an investigation of the effectiveness of fishes as eradicators of the aquatic stages of the mosquito, and the conduct of such operations as would promise secure "fish control" in the extra-cantonment zone, where there were many swamps, ponds, and small lakes in which control by oiling was impracticable. This area covers a territory approximately a mile wide surrounding the camp, the city of Augusta, and a belt about a mile wide surrounding the city limits. The swamps, fortunately, were nearly all drainable, but the ponds were mostly so situated and of such a nature that draining was either impracticable or impossible. The ponds, however, presented a situation which offered excellent opportunities for testing the practical value of fishes as eradicators of mosquito larvæ and pupæ. Experiments were at once started and observations were continued from March, 1918, to November 8, 1918. Much credit for the success of the work is due the local authorities of the United States Public Health Service for their excellent cooperation in furnishing labor, transportation, and other facilities for conducting the investigation.

Quite a number of species of fishes have been mentioned by writers in connection with the mosquito problem. The usefulness of some of these in aquaria and small pools, at least, is well known, but accurate information as to their effectiveness in larger bodies of water, and especially in places where the immature mosquito finds protection among plants or débris, is largely wanting. The summer's investigation was almost wholly devoted to the determination of the practical value in antimalarial work of the top minnow, *Gambusia affinis* (Baird and Girard).

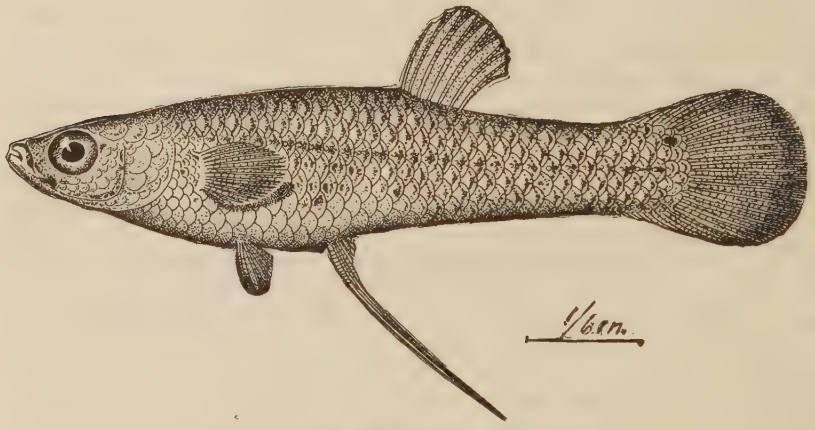
The experiments were conducted in a large series of ponds which afforded many different conditions. It is the writer's intention to relate how the investigation was conducted and to mention results and conclusions. It is hoped that the value of the top minnow may

[a] This report embodies the results of investigations conducted by the Bureau of Fisheries in cooperation with the Public Health Service and was published originally by the United States Public Health Service in Public Health Reports, Vol. 34, No. 21, May 23, 1919.

become better understood thereby and that the observations reported will be of help to those who in the future may wish to employ this useful little fish in antimalarial work.

GENERAL TOPOGRAPHY OF AUGUSTA AND SURROUNDING TERRITORY.

The city of Augusta is situated on the Savannah River, in a low and rather flat valley, and because of the recurrence of floods and the consequent danger to life and property, a levee was constructed between the river and the adjacent territory. However, there is a considerable elevation westward or toward the "Hill" section of the city, beyond which lies Camp Hancock. The one-mile belt surrounding the city extends across the Savannah River and includes a section of South Carolina. There were many swamps in this rather flat territory, but fortunately most of these were drainable and have been eliminated by the United States Public Health Service in coop-



Gambusia affinis (male).

eration with the authorities of Richmond County and the city of Augusta. In addition to the swamps there are many ponds. Nearly all of these are artificial and they vary in size and depth. Drainage, in most instances, is impracticable, if indeed not impossible. The majority of these ponds were made in the manufacture of brick, an industry which was started in Augusta in about 1808. The clay pits made by these manufacturing concerns, because of the flat nature of the country, soon become filled with water. Sometimes after hard rains the water is pumped out and digging is resumed in the old pits, but frequently the digging machines are moved. Thus new ponds are being formed constantly. There are more than one hundred of these clay pits in the territory under protection, and in addition there are a number of ponds or lakes which were made for the purpose of furnishing a water supply, or for water power.

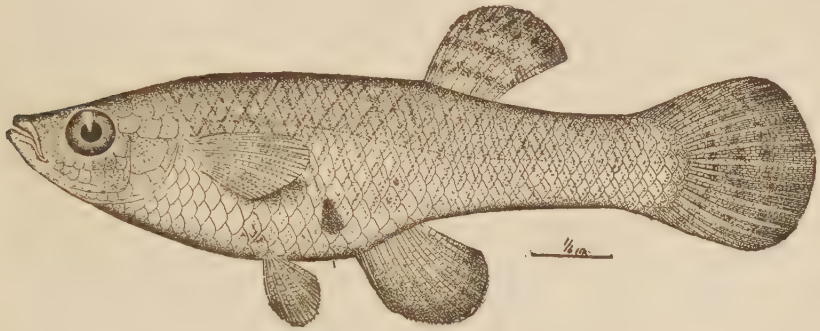
These ponds present a variety of conditions. Some of them are very old and have become partly filled with sediment; the shores are often gently sloping and much aquatic vegetation is present. Such ponds usually furnish an ideal environment for the support of mosquito larvæ. The newer ponds generally have steep shores;

there is not much vegetation, but considerable wave action, and as a rule these ponds are not well suited to prolific mosquito breeding.

GAMBUSIA AFFINIS AND THE GENERAL PLAN PURSUED IN TESTING ITS VALUE IN ANTIMOSQUITO WORK.

Gambusia was selected for the present tests because, first, it seeks its food at the surface, which appears to make it especially suitable for antimosquito work; second, it lives and thrives under a large variety of conditions and especially in water suitable for the support of mosquito larvæ; third, it proved to be quite common in the extracantonment zone and adjacent territory; fourth, it is very prolific; and fifth, its usefulness in destroying mosquito larvæ in aquaria and fountains was already well known.

This fish does not lay eggs, but gives birth to well developed and very active young. It, therefore, requires no special environment, as most other fishes do, for depositing and hatching the eggs. Young



Gambusia affinis (female).

of the season were noticed for the first time on April 24, and during the latter half of October a gravid female still occasionally appeared among collections. The author,[a] working with *Gambusia* at Beaufort, N. C., found that it breeds throughout the summer and that a new brood is produced at intervals of about one month or six weeks. It was observed that a single female gave birth to six broods of young during a single season. The number of young produced at one time appears to bear a direct relation to the size of the female, a large female producing many more young than a small one. The largest brood observed by the writer numbered 63, but Smith,[b] working with fish from the Potomac River, found 100 in a single brood. The young are approximately one-half inch in total length when born; they are very active and are apparently much better adapted to begin the struggle for an existence than most fish hatched from eggs. They, in fact, are ready to begin the work of destroying mosquito larvæ at once, for the writer has seen them attacking and eating small and even medium-sized mosquito larvæ in aquaria before they were a day old. *Gambusia* gains growth rapidly and the earliest broods of the season, born in April and May, become

a Hildebrand, Samuel F., Report, U. S. Commissioner of Fisheries, Appendix VI, 1917, p. 6.
b Smith, H. M., Science, n. s., Vol. XXXVI, 1912, p. 224.

sexually mature and produce young when four to five months old. The later broods of course do not produce young until the following season.

The general plan pursued in testing the practical value of the top minnow in antimalarial work may be divided into three principal lines of activity, viz: First, that of protecting *Gambusia* in the area in which the tests were to be made; second, that of increasing the number of top minnows in the ponds in which the mosquito nuisance was to be abated by means other than protection; and, third, that of making careful field observations.

THE ABUNDANCE OF GAMBUSIA, ITS ENEMIES, AND HOW IT WAS PROTECTED.

The top minnow was present in nearly all of the older ponds, doubtlessly having reached these during times of flood. It, however, was not found abundant, except in a very few ponds and swamps. The common local practice of using *Gambusia* for bait for larger fish without doubt resulted in keeping the top minnow from becoming more abundant. Then there were certain ponds with insufficient shallow water to provide protection for the minnows from larger fish, and in at least one instance a lake had become greatly overstocked with predacious fishes, so that there was a great dearth of food. This lake is situated in Allen Park, within the city of Augusta. It had been artificially stocked with large-mouthed black bass, locally known as "trout," in addition to several species which probably reached it during floods. Bass of 3 inches and upward in length were almost constantly present in very shallow water, preying on the top minnows. Sunfishes were also present in the shallow water, but it was not observed that they actually fed on the minnows. In August it was quite evident that fewer *Gambusia* were present in this lake than there were in April, notwithstanding the fact that approximately 18,000 minnows had been introduced from other sources during the intervening months. Other ponds apparently well stocked with sunfishes and bass, and which certainly did not offer better protection for the minnow than the lake in Allen Park, were stocked with *Gambusia*, but in none of these did such disastrous results ensue. In Allen Park all fishing was prohibited, while in the other ponds there was a limited amount of hook and line fishing. The entire prohibition of fishing in Allen Park doubtlessly accounts for the great abundance of predacious fishes, and the shortage of food made it necessary for the fish to venture into shallower water than they ordinarily do in search of food. Later when an effort was made to give *Gambusia* a chance of survival in Allen Park, it was learned that the shortage of food was so great that cannibalism had undoubtedly prevailed.

The following experiment shows that the common local species of sunfishes are not serious enemies of *Gambusia*. It, therefore, is quite certain that the bass was the chief enemy of the minnow in Allen Park. An old pond, measuring about 75 by 50 feet, with an average depth of approximately 5 feet, was stocked during the first week of April with about 3,000 sunfishes. Probably about 90 per cent of the fish were bream, *Lepomis incisor* (Cuvier and Valenciennes), and the others were warmouth and a few of other species.

The pond was already well stocked with *Gambusia*, and it doubtlessly possessed conditions suitable for the propagation of the top minnow, but probably not for that of sunfishes. However, there were present before stocking a few sunfishes. The bottom of the pond was very muddy, the shore edges were almost free of vegetation, there was little algæ, and the water was quite foul. Nearly all of the sunfishes lived, so far as known, and the top minnow made a notable increase during the summer. It undoubtedly is true that *Gambusia* is not as abundant in this pond with the large number of sunfishes present as it otherwise would have been, but the experiment certainly shows that the bream is not very destructive to the top minnow.

Gambusia in a few instances needed protection from natural enemies, but much more generally from man. The top minnow had become quite a favorite bait for larger fish, and wherever this fish was fairly common, fishermen and bait collectors were frequently seen catching it with small seines and dip nets. This practice quite certainly did more than any other one thing toward preventing *Gambusia* from becoming more abundant. Consequently, it was thought advisable to publish a notice in the local newspapers, explaining that this fish was useful in destroying the wiggle-tail and asking fishermen to kindly discontinue using it for bait. In addition, a placard was posted at each pond, stating that the small fish were protected as a health measure and that they were not to be used for bait. The response to these requests was most cordial, as not an offender was seen.

Several ponds with steep shores provided very little shallow water and the top minnow did not thrive. These ponds supported larger fish, including the large-mouthed black bass, and it is believed that they destroyed the minnows. The chief protection which *Gambusia* finds from the larger predacious fishes, appears to be shallow water. An effort, therefore, was made to provide this protection in the above-mentioned ponds by grading the shore at several points in each pond. The difficulty encountered in the pond in Allen Park has already been mentioned. This greatly overstocked lake was seined, and a large number of predacious fishes were removed. It was then restocked with *Gambusia*, and after that, bass were not observed feeding on the top minnow. The provisions against natural enemies were made too late in the season to bear very evident results during the present investigation.

MEANS AND METHODS EMPLOYED IN STOCKING PONDS WITH GAMBUSIA.

Minnows for stocking ponds were secured mainly from two sources; first, from swamps within the protected area which were being drained; and second, from waters outside of the extra-cantonment zone, from places where minnows did not appear to be needed. Large numbers of minnows were secured from these sources and placed in ponds where few or none were present.

One pond, about 100 by 30 feet, with an average depth of about 3 feet, was used as a "hatchery." This pond has a very muddy bottom and it supports much algæ and several attached plants. All fish were removed from this pond. Then a partition, composed

partly of a dam and partly of wire netting, was built across the pond. About 3,000 adult female *Gambusia* were placed in the larger compartment. No record was kept of the number of males which were introduced, as this is relatively unimportant,[a] but there were probably not more than 10 to each 100 females. The purpose of dividing the pond into two compartments, using a one-fourth inch wire screen for a portion of the partition, was to give the young fish an opportunity to migrate to that section of the pond where they could not be followed by the adults. This was thought advantageous because of the cannibalistic habit of *Gambusia*, which the mother, in confinement at least, so impressively displays by eating her own young oftentimes nearly as rapidly as they are born. The one-fourth inch mesh, however, proved to be a little too large, and some of the adults succeeded in getting through it. The reproduction in this hatchery, nevertheless, exceeded all expectations. This pond, being conveniently situated, furnished a ready supply of top minnows for aquaria, fountains, pools, and wells wherever they were found to be needed or as requests for them were received.

A very useful net for collecting top minnows is a small bobbinet seine. The one used by the writer was about 12 feet long and 3 feet deep. Such a net, if made of a good grade of netting, is light and durable, and it can be quickly and easily handled. A dipnet, also made of bobbinet, was used to some advantage in places where there was so much vegetation that a seine could not be operated.

OBSERVATIONS AND EXPERIMENTS.

Field observations were made at all ponds in the protected zone at more or less definite intervals of one week each throughout the investigation. These were often extended beyond the protected area for the purpose of obtaining checks on the effectiveness of the work within the zone.

As early as March 29 a certain pond was found to be fairly alive with mosquito larvæ and pupæ. Further investigation proved that no fish were present. Top minnows were then placed in the pond for the purpose of observing whether or not the fish would destroy the large numbers of immature mosquitoes. The fish, however, all died in less than 45 minutes. Since the pond was near that portion of the Georgia Chemical Works where sulphuric acid is manufactured, the presence of a chemical fatal to fish life was at once suspected. A litmus-paper test gave a strongly acid reaction. While the first purpose of the experiment failed, it, nevertheless, was learned that mosquitoes can breed in water so strongly acid that *Gambusia* is killed almost instantly thereby. There, however, was another pond very near the acid pond and in appearance very similar to it. This one was well supplied with top minnows in addition to a few food fishes, and it was entirely free of mosquito larvæ. As it did not seem reasonable that mosquitoes would select the acid pond in preference to the unpolluted one for breeding purposes, the only apparent logical conclusion was that the absence of mosquito larvæ in the latter was due to the presence of natural enemies or fish.

Another situation very similar to the one discussed in the preceding paragraph was not far away, for there were nearly end to end an

[a] Hildebrand, Samuel F., Report, U. S. Commissioner of Fisheries, Appendix VI, 1917, p. 7.

acid swamp and the pond previously referred to as the hatchery. *Anopheles* bred in the acid swamp throughout the season, except as interrupted from time to time by the application of oil. The hatchery pond, which was evidently well suited for the support of *Anopheles* larvæ, was, nevertheless, free from them, except when the vegetation became dense and provided protection.

On April 1, mosquito larvæ of the *Culex* type were found in a ditch, in several pools, and in a large pond. These waters were all free of débris and vegetation. The pond had steep shores, and it was very clean. It was one of the newer brickyard ponds, and no fish were present. All of these places, being close together, were stocked with *Gambusia* at the same time. Only 6 fish were placed in each of the pools, which were about 10 to 12 feet long, about 2 feet wide, and very shallow. Each pool supported thousands of mosquito larvæ, but in about two weeks they were made entirely free of wrigglers by the fish and remained so until they became dry later in the season. The presence of comparatively few skins showed that not many of the larvæ reached the adult stage. The ditch referred to was approximately 30 feet long and 1 foot wide. Mosquito larvæ were especially abundant in it. About 200 top minnows were placed there, and in two weeks it was completely free of wrigglers. Mosquito larvæ were seen only along the shore of the big pond. It was at first stocked with about 1,500 *Gambusia*, but later several thousand more were added. The larvæ in this pond, too, disappeared in about two weeks from the time the first fish were introduced and none were again seen until September. By that time the shores had become overgrown with vegetation which furnished protection for *Anopheles* larvæ against fish. This vegetation was cut and the shores were raked. A large school of top minnows followed the workmen, destroying the immature mosquito and other insect larvæ as quickly as their hiding places were destroyed.

It was possible in several instances to connect ditches and swamps which were thickly infested with mosquito larvæ with ponds that were well supplied with top minnows. Wherever this was done, large numbers of fish entered these waters and destroyed the mosquito larvæ in a surprisingly short time.

For the purpose of comparison and as further evidence of the value of *Gambusia* in controlling mosquito breeding two other small ponds are worthy of mention. These ponds are situated at the intersection of the tracks of the Georgia Central and the Belt Line railroads, and they are of about equal size. The top minnow had reached one of the ponds from an unknown source, and it was entirely free of mosquito larvæ. The other was without fish, and mosquitoes were breeding in it in abundance. The inference, in the absence of any evidence to the contrary, of course, is that the top minnows destroyed the mosquito larvæ in the first pond.

During the latter part of October two new brickyard ponds were found to be breeding large numbers of mosquito larvæ. The ponds had become supplied with some vegetation; the mosquito larvæ, however, were not confined to these hiding places, but were quite generally distributed over the ponds, and could be seen in perfectly clear water. *Anopheles* larvæ previously had been noticed only once away from all protection, and then, as now, in a pond not stocked with fish. On October 23 about 1,000 *Gambusia* were placed in one pond

and the other was left as a control. On October 26 no pronounced reduction in the number of larvæ in the pond which had been stocked was noticeable. On October 29, however, a remarkable decrease was evident, only a few larvæ being left, and these were found in vegetation. At the end of this time the immature mosquitoes in the other pond (control) were as abundant as ever.

Many similar experiments and observations could be mentioned, but as the results for all were nearly identical it is not advantageous to do so. It then may be stated that wherever mosquitoes were breeding prolifically *Gambusia* was not present, but, if introduced, mosquito breeding was eliminated or at least greatly reduced. Wherever the complete elimination of mosquito larvæ did not result, if sufficient top minnows were present the immature mosquitoes were so protected by vegetation or débris that they could not be detected or reached by the fish.

All aquatic plants, however, do not furnish protection for mosquito larvæ and pupæ against fish, and some even may be repellent. The following-named plants appeared to provide good protection and caused considerable trouble during the investigation: (*a*) The aquatic grass, *Hydrochloa carolinensis;* (*b*) "Coon-tail moss," a species of *Myriophyllum;* and (*c*) Algæ. The aquatic grass grows in shallow water and along the shores. It has many slightly submerged leaves over which the horizontally floating or swimming *Anopheles* larvæ hover, out of sight and out of reach of fish. Wherever this plant occurs some *Anopheles* larvæ are almost sure to be present regardless of the abundance of *Gambusia.* It, therefore, is obvious that if this plant occurs in ponds in which mosquito control is desired, it must be removed. This may be done by cutting and raking, or if growing in soft mud it may be pulled up by the roots.

The plant locally known as "coon-tail moss" causes trouble only when it becomes detached and rises to the surface. This plant was present in only a few ponds in which an endeavor was made to secure mosquito control, and it caused considerable trouble in only one. It is ordinarily attached to the bottom, but in this instance some of the plants became detached from time to time and came to the surface. There each plant collected more or less débris, algæ grew among its branches and thus formed a mass in which both types of mosquito larvæ found protection. This floating mass must be removed from time to time; this can be done best on a windy day when it drifts inshore.

Algæ often form mats which float at or near the surface. Mosquito larvæ, particularly *Anopheles,* find protection from fish over and in these mats. Copper sulphate was used in the proportion of 8 pounds to 1,000,000 gallons of water for killing the algæ, but this treatment must usually be repeated frequently. Toward the close of the season a light gas oil, used by the local office of the United States Public Health Service in antimalarial work, was sprayed on the algal pads wherever the use of the water did not preclude this practice. This oil, if used in moderate quantities, is not injurious to fish; it can be quickly and conveniently applied, and it is very effective, for the algal pads act like sponges, retaining the oil and making them uninhabitable for the mosquito.

Water lilies do not, as a rule, appear to furnish much protection while growing, but some of the plants die from time to time. The

leaf then often partly sinks, forming a depression over the center while the edges remain at the surface. The cup thus formed holds enough water to support mosquito larvæ, and with respect to fish the larvæ contained therein are perfectly safe. When the dead leaves drift inshore, they of course frequently make places inaccessible to fish.

Grasses and rushes and other plants, having straight stocks and no slightly submerged leaves, furnish no protection. Areas overgrown with such plants have been carefully examined for mosquito larvæ, but wherever *Gambusia* was present no immature mosquitoes were found.

The aquatic plant, *Naias flexilis*, which was common in several ponds, forming a dense growth over the bottom, normally does not provide protection, as it does not reach the surface of the water. During the severe fall drought the water, however, became so low that it was near the surface or partly exposed in many places, making such a dense mass that fish could not penetrate it. Wherever this occurred it furnished excellent protection and *Anopheles* larvæ and pupæ were common.

The duck weed, *Spirodela polyrrhiza*, was present in only one pond, over which it formed an almost continuous cover. No mosquito larvæ were seen in this pond, indicating that this plant does not furnish protection for the mosquito from fish. It, in fact, is likely that mosquitoes can not breed under such conditions, but as this pond was well supplied with *Gambusia* no data supporting this probability were obtainable therefrom.

The smart weed (*Polygonum*) is another plant that not only does not appear to provide protection but which may actually be repellent. Many places overgrown with this weed were repeatedly examined, but mosquito larvæ were not found even in apparently favorable hiding places.

Nearly all marginal plants, by projecting partly into the water, by falling into it after maturing, or by becoming partly submerged after freshets, furnish protection for mosquito larvæ. These plants should be removed when possible.

It is evident from the study of plants in relation to mosquito control by means of fish that it is highly desirable to remove from the ponds those plants having leaves just below the surface of the water and to treat algæ in such a way as to make them useless as protectors of mosquitoes. The presence of these plants was by far the most important obstacle to be overcome in securing mosquito control in the many ponds in the extra-cantonment zone of Camp Hancock. A rather constant vigilance was necessary in order to keep a large series of ponds free of such plants, but it is not very difficult work or usually very expensive, for two laborers provided with hoes, rakes, a knapsack spray can, and some oil could take care of quite a number of ponds during the course of a season. In badly infested ponds it is occasionally advantageous to cut the vegetation with a patented device known on the market as a submarine saw.

It is very interesting to observe how quickly the top minnows learn to follow the workmen engaged in cutting and raking vegetation from ponds. They soon become quite tame and schools of them work almost under the tools of the laborers, catching mosquito larvæ and other insects as quickly as their hiding places are destroyed.

This work around the ponds caused the top minnows to become tame, and that made it possible to perform certain feeding experiments which otherwise could not have been made. One of these feeding observations is described in the writer's field notes as follows: "I took several large *Anopheles* larvæ from dense vegetation and placed them in open water among top minnows. With one larva was a small piece of bark. The larva hovered over this piece of bark and the fish did not detect it. When it was placed in open water, without the least protection, the fish swam around it, even 'nosed' it, while the larva lay perfectly motionless. At last a rather small minnow seized and swallowed it. Placed another larva in open water among fish. This one too lay perfectly still, drifting like a small stick, while fish swam all about, nosing it a time or two, but apparently not detecting that it was alive and something to eat. Finally it drifted near a tuft of grass and with a surprisingly quick movement it swam into the vegetation. It was removed and placed in open water. There it lay motionless for about five minutes, when at last it was snapped up by an undersized minnow. A third was placed in open water; it too drifted along perfectly motionless for about five minutes before it was finally detected by an undersized minnow. Once this larva drifted very close to the grass from which it was originally removed, but it made no effort to get back into it. This may have been due to the presence of fish between it and the grass." In some of the feeding experiments the larvæ were much more quickly detected by the fish than in the one just described. The rapidity with which they are found and eaten probably depends to a certain extent, at least, upon the eagerness with which food is being sought by the fish.

These feeding experiments, which were repeated many times, demonstrated that the protective instinct in mosquito larvæ is highly developed. It was shown many times that the only protection an *Anopheles* larva has from fish in open water is inactivity. When the larva thus drifts along fish evidently mistake it for an inanimate object, for, as already shown, they may swim all around it for several minutes, even touch the larva with the snout and yet not discover that it is food. The slightest movement, however, on the part of the wriggler apparently never goes unseen and it is instantly seized and devoured by the fish. It often happens that a mosquito larva placed in open water drifts toward places of protection before it is discovered by the minnows and, if no fish are very near, or are present between the larva and the place of protection, it moves toward it with a remarkable rate of speed and quickly places itself over the object near the surface of the water where it can not be seen by fish. It, however, remains motionless if fish are near.

It is not to be assumed from what has been said in the foregoing paragraphs that mosquito larvæ are as abundant in vegetation and débris when *Gambusia* is present as when absent. An *Anopheles* larva may find temporary protection over a blade of grass, but it is scarcely probable that this larva will spend its entire existence over a single blade of grass, and, if it moves, it is in great danger of losing its life. Then when it reaches the pupal stage the blade of grass is obviously not as well suited as previously to furnish protection. In this stage of life the mosquito appears to be much more active than in the larval stage. This would endanger its life still further, for it

has been shown that in the presence of fish, action is certain destruction. The presence of larvæ in a pond, therefore, must not be taken as a certain criterion that fish are failing to provide mosquito control. On the other hand the many dipping experiments have shown that comparatively few mosquito larvæ are present in the best hiding places, if *Gambusia* is at hand, for rarely more than three or four larvæ were taken at one time. When *Gambusia* was absent, it, however, was not unusual to take so many larvæ at one dip that they could not be accurately counted in the dipper.

It, then, is evident that mosquito breeding, if not entirely eliminated, is at least greatly reduced by the top minnow.

THE NUMBER OF TOP MINNOWS NECESSARY IN ORDER TO SECURE MOSQUITO CONTROL.

The writer has already been asked several times the general question, "How many top minnows are necessary in a pond in order to prevent mosquito breeding?" Data upon which a definite answer could be based are extremely difficult to obtain, for there are scarcely two ponds which offer identical conditions. The size of the pond of course must be considered; whether or not it is subject to wave action is of importance; the presence or absence of vegetation is very important; and the presence or absence of enemies of *Gambusia* must not be overlooked. Even then, we can only make a guess, for anopheline mosquito larvæ, at least, breed much more prolifically in some ponds than they do in others for reasons not understood.

A pond on the Milledgeville Road belonging to the Sanitary Dairy Co. furnishes a notable example of a place which is apparently well adapted to mosquito breeding, yet during many inspections comparatively few larvæ were found. Among them were present not more than a half dozen *Anopheles*. There is much vegetation present along the shores, consisting principally of aquatic grass, and there is considerable débris. *Gambusia* is wanting, and the species of fishes which are present failed to provide mosquito control elsewhere. Furthermore, wherever apparently similar conditions prevail in other ponds, particularly with respect to the presence of aquatic grass, some *Anopheles* larvæ were present regardless of the abundance of *Gambusia*.

That *Anopheles* do not breed in some places which apparently offer excellent conditions for the support of the larvæ has been noted by Le Prince and Orenstein:[a] "In many places apparently well fitted for the support of *Anopheles* larvæ they were absent yet lived and developed when placed therein as an experiment. The reason why *Anopheles* eggs are not laid in certain areas apparently in every way similar to those in which larvæ are found is yet unexplained."

It has been demonstrated through laboratory tests that one top minnow may destroy a large number of mosquito larvæ in a short time. The writer[b] observed that one adult female ate 165 large larvæ in less than 12 hours, and Seale,[c] working with this fish in the Philippine Islands, reports that one pair of half-grown *Gambusia* ate 5,041 mosquito larvæ, by actual count, from December 9, 1915, to

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a Le Prince, Joseph A., and Orenstein, A. J., Mosquito Control in Panama, p. 12. Putnam, New York and London, 1916.
b Hildebrand, Samuel F., Report U. S. Commissioner of Fisheries, Appendix VI, 1917, p. 5.
c Seale, Alvin, The Philippine Journal of Science, Vol. XII, sec. D, No. 3, Manila, 1917, p. 180.

February 25, 1916. It has been shown in this paper that a small number of minnows freed badly infested pools of mosquito larvæ in a short time; also that they destroyed the mosquito larvæ in ponds and kept the ponds free of the aquatic stages of the mosquito, unless protection was provided by plants or débris. From the knowledge which has thus been gained we may conclude that, if a pond furnishes little or no protection for mosquito larvæ, a small number of top minnows is sufficient, but if it does furnish protection a much larger number is desirable. Antimosquito work, however, may be started with a very small number of *Gambusia*, for this fish multiplies rapidly. There appears to be no danger of overstocking, as observations indicate that the more fish a pond supports the more certain are the practical results.

OTHER SPECIES OF FISHES IN RELATION TO ANTIMOSQUITO WORK.

No special experiments were conducted with other species of fishes in relation to mosquito control, but some information was gained from incidental observations.

Fundulus nottii.

The "star-headed minnow," *Fundulus nottii* (Agassiz), is probably of considerable value in antimalarial work. Its habits are very similar to those of *Gambusia*, for it feeds at the surface and frequents localities suitable for the support of mosquito larvæ. Its habits certainly are such that it is worthy of a trial. This fish occurred in a few ponds in the protected area, but as *Gambusia* was also present, nothing definite in regard to their value could be learned from these sources. This species, however, was very abundant and *Gambusia* scarce in a lake located just off the Old Savannah Road, about 8 miles distant from Augusta, belonging to the Carmichael Hunting Club. This lake apparently offered excellent conditions for the support of *Anopheles* larvæ, but during two visits when several hundred yards of shore edge margined with considerable vegetation were examined only a very few larvæ were seen. The scarcity of mosquito larvæ was very probably due to the presence of *F. nottii*, unless this pond should happen to be one of those in which mosquitoes do not oviposit for reasons unknown.

Several species of sunfishes have been mentioned by authors in connection with antimosquito work, but the writer's observations indicate that they are of doubtful value. For example, one large pond supplied with bream, warmouth, and the blue-spotted sunfish supported large numbers of mosquito larvæ of both types, and top

FIG. 1.—POND ABUNDANTLY STOCKED WITH SUNFISHES AND TOP MINNOWS.

FIG. 2.—SECTION OF HATCHERY.

Notice reads: "Small fish in this pond are protected by the United States Public Health Service as a health measure, and must not be used for bait."

FIG. 3.—SECTION OF HATCHERY SHOWING PARTITION BETWEEN PONDS (A PORTION OF THE GEORGIA CHEMICAL WORKS IN BACKGROUND).

FIG. 4.—SPRAYING OIL ON AN ACID SWAMP IN WHICH FISH CAN NOT LIVE BUT WHICH SUPPORTS ANOPHELES LARVÆ.

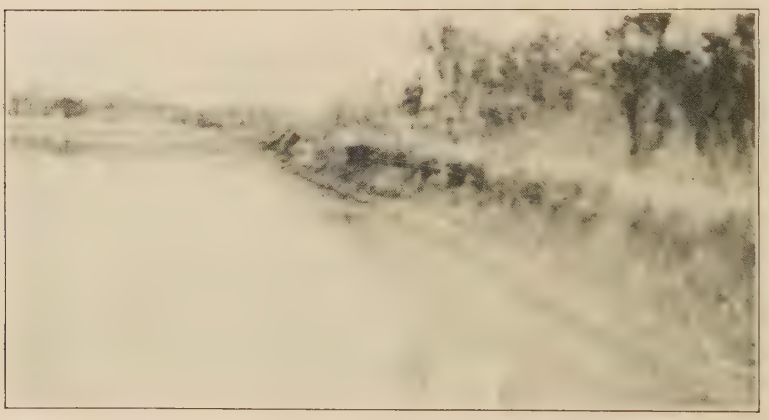

FIG. 5.—SECTION OF CLEAN SHORE OF A POND WHERE MOSQUITO LARVÆ WERE ABUNDANT BEFORE INTRODUCING TOP MINNOWS.

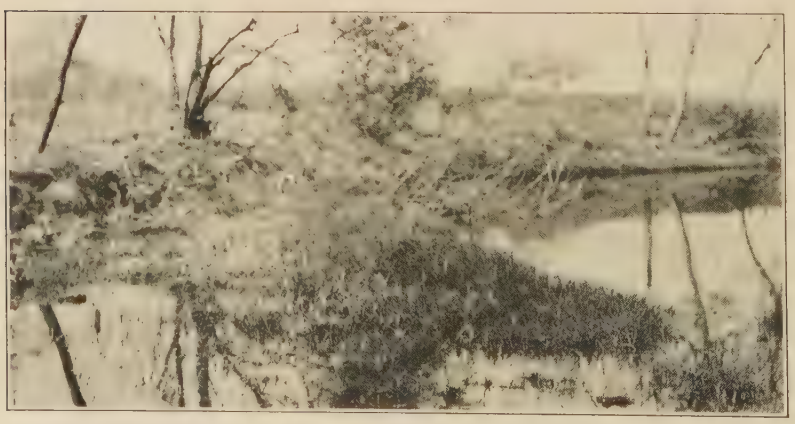

FIG. 6.—SHOWING GROWTH OF AQUATIC GRASS IN CORNER OF POND. SUCH GRASS FURNISHES EXCELLENT PROTECTION FOR MOSQUITO LARVÆ.

FIG. 7.—AQUATIC GRASS GROWING ALONG THE SHALLOW EDGE OF A POND WHERE IT FORMS PROTECTION FOR MOSQUITO LARVÆ.

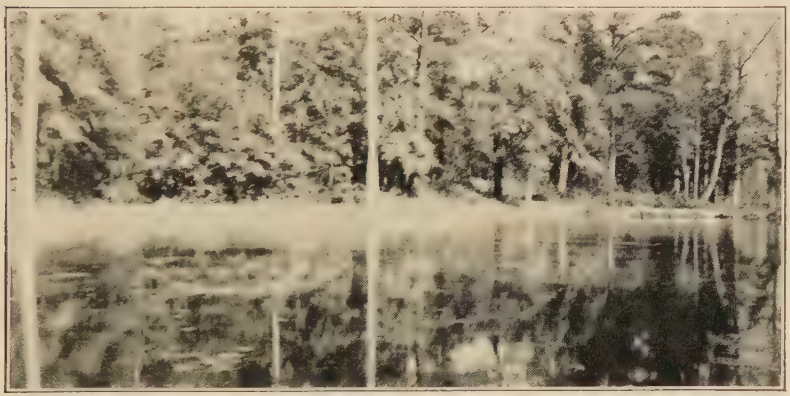

FIG. 8.—FLOATING PLANTS OF MYRIOPHYLLUM AND DÉBRIS WHICH PROVIDE PROTECTION FOR MOSQUITO LARVÆ.

FIG. 9.—TREATING POND WITH COPPER SULPHATE FOR KILLING ALGÆ. LABORER IS DRAGGING A SMALL BAG OF THE CHEMICAL THROUGH THE WATER BY MEANS OF A POLE.

FIG. 10.—SPRAYING OIL ON ALGAL PADS TO DESTROY THEIR USEFULNESS AS HIDING PLACES FOR THE IMMATURE MOSQUITO.

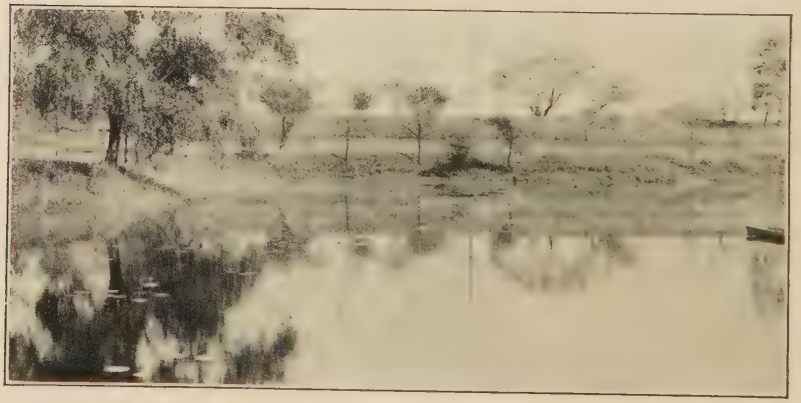

FIG. 11.—SECTION OF POND SHOWING PRESENCE OF WATER LILIES.

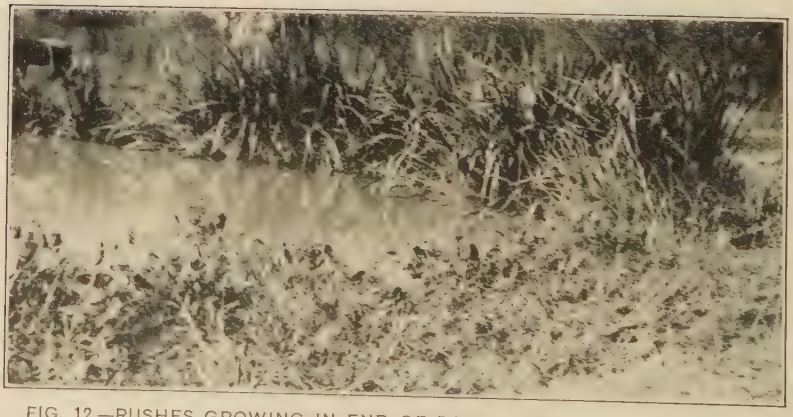

FIG. 12.—RUSHES GROWING IN END OF POND. THESE PLANTS RARELY PROVIDE PROTECTION FOR MOSQUITO LARVÆ.

FIG. 13.—TALL RUSHES AND GRASSES WHICH DO NOT PROVIDE PROTECTION FOR MOSQUITO LARVÆ.

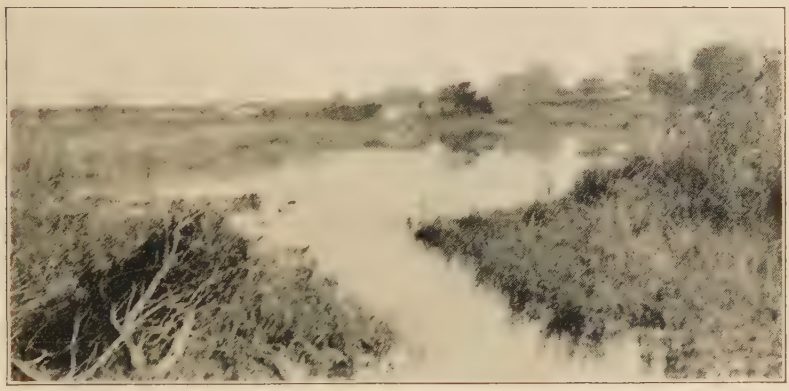

FIG. 14.—POND SUPPORTING DENSE VEGETATION CONSISTING PRINCIPALLY OF SMART WEEDS WHICH DO NOT PROVIDE PROTECTION FOR MOSQUITO LARVÆ.

FIG. 15.—SECTION OF POND SHOWING ABUNDANT GROWTH OF TALL VEGETATION WHICH DOES NOT PROVIDE MUCH PROTECTION FOR MOSQUITO LARVÆ.

FIG. 16.—DISTANT VIEW OF POND. MUCH MARGINAL VEGETATION WHICH USUALLY FURNISHES SOME PROTECTION FOR MOSQUITO LARVÆ.

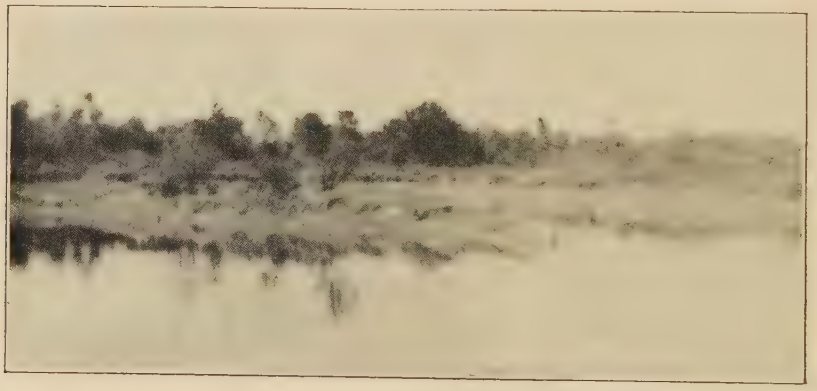

FIG. 17.—SHOWING MARGINAL VEGETATION REMOVED.

FIG. 18.—SPRAYING OIL ON ALGAL PADS.

In foreground is seen some of the aquatic grass, Hydrochloa carolinensis, which provides excellent protection for mosquito larvæ.

minnows had to be introduced in order to secure mosquito control. A similar condition in the presence of sunfishes, the pumpkin seed being the most abundant one, was observed by the writer on the Potomac River at Bryans Point, Md., in 1912.

The size and habitat of the pigmy sunfish suggest that it might be of value in the control of the mosquito, but the information obtained points to the contrary, for *Culex* larvæ were plentiful in unprotected places in a certain swamp where this fish was quite common.

The roach minnow, in confinement, at least, appears to destroy mosquito larvæ, as indicated in the following observation. Two minnows were left in a "bait well" when it was abandoned by bait collectors. This well was about 10 feet long and 5 feet wide with a depth of about 2 feet. The two minnows kept this well wholly free of mosquito larvæ for several months. Then an oil distributor came by, seeing that it was a favorable place for breeding mosquitoes, and not knowing of the presence of the fish, sprayed the well with oil. The oil killed the roach minnows, and after it evaporated mosquito larvæ appeared in countless numbers.

Goldfish, while probably of very little value in large bodies of water where other food is obtainable, are useful in confinement. A considerable number of fountains stocked with goldfish were examined, and if they were properly built so that all parts were accessible to fish, and if fairly free of vegetation and débris, no mosquito larvæ were present.

CONCLUSIONS.

1. *Gambusia affinis* is especially suitable for antimosquito work because: (*a*) It seeks its food at the surface; (*b*) it is very prolific; (*c*) it gives birth to well-developed young, therefore requiring no special environment for depositing and hatching the eggs; (*d*) it lives and thrives under a large variety of conditions and frequents areas especially suitable for the support of mosquito larvæ; (*e*) it usually lives and multiplies in ponds stocked with predacious fishes, providing it has very shallow water for refuge.

2. Plants which have slightly submerged leaves and stems or which form floating masses are the chief sources of protection for mosquito larvæ against the top minnow. Such plants should be removed from the water or treated in such a way as to make them uninhabitable for the immature mosquito.

3. Mosquitoes may breed in water so badly polluted that *Gambusia* is almost instantly killed thereby.

4. *Gambusia affinis* is of great value in antimosquito work. It eliminates the wriggler completely from ponds which are fairly free of protective vegetation and débris. If much protection is furnished by vegetation and débris, the immature mosquito is not entirely eliminated, but the number reaching the adult stage is greatly reduced.

5. The number of top minnows necessary in a body of water in order to secure mosquito control depends largely upon the conditions which prevail with respect to places of protection, i. e., a much smaller number of *Gambusia* is necessary, if the water is fairly free of hiding places for mosquito larvæ against fish, than if the reverse is true.

FISHERY INDUSTRIES OF THE UNITED STATES

REPORT OF THE DIVISION OF STATISTICS AND METHODS OF THE FISHERIES FOR 1918

By Lewis Radcliffe
Assistant in Charge

Appendix X to the Report of the U. S. Commissioner of Fisheries for 1918

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FISHERY INDUSTRIES OF THE UNITED STATES.

REPORT OF THE DIVISION OF STATISTICS AND METHODS OF THE FISHERIES FOR 1918.

By Lewis Radcliffe, *Assistant in Charge.*

INTRODUCTION.

In recent years the only report of the work of this division, including the mass of detailed statistics of the fisheries collected during the preceding calendar year, has been incorporated in the annual report of the Commissioner prepared at the close of the fiscal year. That these statistics and discussions may be made available to the public at an earlier date, and for other urgent reasons, it has been deemed advisable to issue a detailed report of the work of the division at the close of each calendar year. The work of the division for the first half of the calendar year 1918, including the results of several statistical canvasses, has been dealt with in some detail in the Commissioner's report for the fiscal year ended June 30, 1918, and has been omitted from the present report. The results of a canvass of the fisheries of the Pacific Coast States for 1915 were presented in condensed form in the Commissioner's report for the fiscal year 1917. The statistics and other information obtained in this canvass are given in detail in this report.

SUMMARY OF THE WORK.

In its relations with the fishing industries in 1918 the Bureau has striven to render the largest possible measure of service in increasing the consumption of fish and in the development of markets for fishery products, particularly the little-used or neglected forms. Special attention has also been given to increasing the use of the waste products of the fisheries, such as roe and buckroe, the meat of whales and porpoises, etc., for food; the use of fish waste and waste fish for conversion into oil and fertilizer or fish meal as an animal feed; and the use of the skins of sharks and other unused aquatic forms for tanning into leather and the like. The adoption of improved methods and the discontinuance of wasteful practices have been encouraged.

The industries, particularly those engaged in canning and preserving fish by other methods, labor under a serious handicap through ignorance of the scientific principles underlying these operations, the methods being largely empirical. The Bureau has started investigations in the canning and salting of fish for the purpose of establishing the basic principles governing these operations and determining

their application to effect improvement in methods in practice, in the quality of the product, and in economy of operation. Although but recently inaugurated, these investigations give promise of yielding valuable results to the industry and clarifying our understanding of the processes, thereby enabling us to proceed more intelligently.

One of the major functions of the division is the taking of inventories of the fisheries. The importance of such work as a guide to the States in the enactment of proper legislation governing the protection of the fisheries, to mention only one of the needs for such work, should be self-evident. During the year the following statistical canvasses were made: Coastal fisheries of New York and New Jersey, exclusive of shellfish for 1917; the fisheries on Five-Fathom Bank, N. J., for 1916 and 1917; the shad fishery of the Hudson River for the years 1917 and 1918; the fisheries of Lake Pepin and Lake Keokuk for 1917; and the fisheries of the Great Lakes, Lake of the Woods, and Rainy Lake for 1917. In addition, the detailed statistics of the vessel fisheries centering at Boston and Gloucester, Mass., Portland, Me., and Seattle, Wash., have been collected and the information published in the form of monthly and annual bulletins for the use of the trade. These data, together with the results of the canvass of the Great Lakes fisheries, appear in the present report. The Bureau is striving to make its statistical canvasses with sufficient frequency to cover the major geographical divisions of the fisheries once in a five-year period. To do this properly will require a somewhat larger force of statistical agents.

INCREASING CONSUMPTION OF FISHERY PRODUCTS.

The unusual demands on our food resources in 1918 afforded exceptional opportunities for educating the public to the value of fish and fishery products with which it was little acquainted. The Bureau endeavored to meet this situation and employed assistants experienced in the fisheries to assist in the development of markets and the education of the public to the merits of fish as food. It was instrumental in introducing approximately a half million pounds of Gulf fish to the markets of Nashville, Tenn., Louisville, Ky., and Indianapolis, Ind. These shipments, packed under the supervision of Government agents by the most approved methods to insure arrival in the best of condition, were made in car lots by the Gulf producers. This has resulted in enlarging the markets for fish from this region and acquainting many people with the merits of species common to the region. To effect relief for unsatisfactory shipping conditions, similar service was inaugurated between Chincoteague, Va., and the markets of Philadelphia and New York, and a number of shipments were made under supervision of Government agents.

Assistance was rendered in introducing canned river-herring products (fish, roe, and buckroe), sea herring, and gadoid buckroe to the markets of Atlanta, Ga., Birmingham and Montgomery, Ala., and Knoxville, Nashville, and Chattanooga, Tenn.; this resulted in bringing nearly 14,000 cases of these products, valued at over $54,000, to these markets.

Whaling companies were encouraged to save and market whale meat, and a placard and an economic circular were issued to aid in creating a demand for the product and in educating the housewife

how to prepare it. West-coast whaling companies have provided a cold-storage and distributing plant with a capacity of about 3,000 tons, a 500-ton freezing plant, a refrigeration steamer, and a cannery with a capacity of 50,000 cases. In 1918, 30,000 cases of the meat were canned and 195 tons of frozen meat marketed. With available equipment, an output of 50,000 cases of canned meat and 1,000 tons of frozen meat is expected during the coming season.

The following description of the methods employed in the canning of whale meat is taken from the January, 1919, Yearbook of the Pacific Fisherman:

> The equipment and method of canning are quite similar to those used in Pacific coast salmon canneries, with obvious differences in the preliminary handling. The whales for canning are hauled out on a special concrete slip, constantly flooded with fresh running water, and here the meat is removed in the same way as for freezing. After being cooled it is placed in a mild brine for about 36 hours, which removes all blood, at the same time practically eliminating the gamy taste. The strips of meat are then passed through a salmon cutter of familiar type, which cuts them into pieces the right size for 1-pound flat cans. The cans are then put through the exhaust box for 30 minutes, sealed and cooked in the retort for an hour and twenty minutes, after which they are ready for labeling and shipping.

The lack of understanding of the best ways to prepare fish for the table, of the relative merits of the different varieties of fish and fishery products, and their value as food, is to a considerable extent responsible for the lack of demand for fish. Such obstacles can best be met by education and practical demonstration. To do this, representatives of the Bureau were detailed to give lectures and demonstrations in fish cookery, beginning in May and continuing throughout the year. More than 70 demonstrations were given, the following places being visited: Seattle, Everett, Bellingham, Spokane, Yakima, and Aberdeen, Wash.; Portland and Gladstone Park, Oreg.; and San Francisco, Oakland, Berkeley, Alameda, Stockton, and Sacramento, Calif. These demonstrations were very popular with the housewives, the average attendance being about 100 persons.

The following fish and fishery products were used for demonstration purposes: Albacore, barracuda, bocaccio, bonito, carp, catfish, flounders, hake, halibut, kingfish, lingcod, chub mackerel, horse mackerel, grayfish, perch, rockfishes, sablefish, sand dab, sardine, shad, skates, skipjack, smelt, soupfin shark, sole, sturgeon, yellowtail, and heads, milts, and livers of salmon; also squid, octopus, and whale. Among the forms especially popular were shark, squid, skate, yellowtail, sablefish, flounders, sole, kingfish, mackerel, and salmon milts.

Buying of fish in the round, the viscera alone being removed, was advocated. This is cheaper and much waste is eliminated, as the head, trimmings, and bones, which are richest in flavor and are usually discarded by the dealer, are thus saved. These parts are used to make delicious soups and gravies, or, if in smaller quantity, as the foundation for a cream sauce. In thus utilizing practically every part of the fish for food, one day's supply will usually serve for two.

In place of frying, the hot-oven method of cooking was recommended. By this means practically all the unpleasant odors of cooking fish are eliminated, economy in the use of fats is effected, and time is saved in both cooking and serving. Creamed dishes, souffles, and imitation chops are made from left-over fish. Salads also are made from these, as well as from freshly steamed fish.

Through these demonstrations large numbers of women have learned that fish, when properly cooked, are most delicious, and that many of the cheaper varieties are fully the equal of some of the better-known, high-priced species. In addition, the fish dealers everywhere have been enthusiastic in the reports of increased sales of fish demonstrated. The need of more educational work of this character is evidenced at all points visited.

NEED OF LABORATORIES FOR THE SOLUTION OF THE PRACTICAL PROBLEMS OF THE INDUSTRY.

Agriculture has benefited greatly by the work of the agricultural experiment stations, both Federal and State, through colleges devoted to the training of men and women for the industry, and through the study of the problems by highly skilled experts. The fisheries, the other great food-producing industry, with their innumerable problems, have lacked and suffered for lack of these advantages, with the result that the methods in practice have been developed empirically, without definite knowledge of the basic principles governing the operations or without their application to the best and most economical advantage. The fact that a method has worked, has sufficed. Fuel, time, labor, and food are wasted, and fisheries remain undeveloped for want of satisfactory methods of preservation and markets for the products.

The preservation of fish by salting will serve to illustrate. Although this has been practiced for centuries, there has been little improvement in the methods; large quantities of cured fish are lost annually by spoilage, and still larger quantities of fresh fish, for which no ready or accessible markets exist, are thrown away because of the possibility of loss if cured. The man in the industry is confronted with innumerable problems of spoilage, quality, color, or practical methods, and the like, problems which should be solved if the industry is to progress, but which remain unsolved because the individual lacks the facilities and frequently the training necessary to their solution.

There is also an underconsumption of fish, due, in part, to the inferior quality of much that is placed on the market, and, in part, to the consumer's ignorance of the dietetic qualities and peculiarities of the various species and their consequent improper preparation for the table. As described above, the increasing consumption of fish in districts where the Bureau educated the public to the merits of fish as food by means of lectures, demonstrations, placards, and circulars but serves to emphasize the need of further public educational work along such lines.

For years the Bureau has been handicapped in this field for lack of facilities for practical demonstration and experimentation in the methods of preparing and preserving fishery products. It has held that it should be provided with adequate equipment and personnel to render effective aid to the industry, to do in its particular field what the agricultural experiment station does for agriculture, and that it could accomplish some important results in some fields within a short period of time.

FISHERY PRODUCTS LABORATORY.

A step has been taken in this direction, however. On July 2, 1918, the President approved and authorized an allotment of $125,000 from the fund for the national security and defense to enable the Bureau to build and equip in Washington, D. C., a laboratory in which to conduct work of this character. Work was begun immediately on the plans for the building and its equipment. Before the end of the year construction of a building of hollow tile and concrete, 45 by 80 feet, with two floors and an attic, had been begun and orders for equipment were being placed. It is expected that it will be completed and fully equipped by July 1, 1919.

On the first floor there is a large work laboratory, a chemical laboratory, low-temperature rooms for storage and refrigeration, a built-in smokehouse, incubation room, and storeroom. On the second floor are a large laboratory, a fishery-products exhibit and demonstration room, an experimental kitchen, and offices. Convenient arrangements for supplies of water, gas, and electric power have been made, and a steam boiler for supplying steam to the various units is provided for. Vacuum and compressed air pipes will be placed in convenient places.

For canning purposes there are to be a complete plant for sealing tin cans by a double seamer, an exhaust box, a retort with steam supply, a complete equipment for sealing and processing glass containers by a vacuum process, and another for tin containers in vacuo. An experimental plant for freezing fish in brine by the Ottensen method has been imported from Denmark and has been employed to demonstrate the method to interested members of the industry. For drying fish and fishery products an apparatus is being provided in which the heat will be controlled, the humidity of the air brought to any degree desired and held at that point by an air conditioner, and the volume of air driven over the product by motors controlled with dampers. This is, of course, not intended for commercial purposes, but for experiments of wide latitude. There is also a built-in smokehouse of hollow tile and cement, with a flue, iron air-tight doors, ventilators, shavings pans heated with gas, a long-distance recording thermometer, and dampers for control of heat and ventilation. Cooking vats, a hydraulic press, a filter press, and a grinder will be provided for use in problems connected with the utilization of fish waste.

The incubation room will be provided with a recording thermometer and hygrometer and electric heat. Automatic control will afford means of holding any constant temperature above ordinary temperatures up to 112° F. For refrigeration purposes a carbon-dioxide machine is to be employed, and three rooms of different temperatures, automatically controlled, the lowest ranging to −20 or −25° F., are to be provided. The experimental kitchen is fully equipped for the purposes it is to serve, as is the chemical laboratory.

In the conduct of experimental work it is regarded as of great importance that all factors which influence the character of the products be known, measured, and controlled, for it is usually by altering factors that improvements are effected. In the industry these factors—time, temperatures, strengths of brine, fuel for smokehouse, and purity of materials—are seldom measured and never

controlled. Careful consideration has, therefore, been given to means of measuring such factors in the laboratory and varying and controlling them as investigation necessitates. Wherever required, recording thermometers and hygrometers, thermostats, pitot tubes, pressure and vacuum gauges, and other measuring and controlling devices have been installed, and measuring apparatus, such as a viscosimeter, refractometer, polarimeter, colorimeter, specific-gravity balances, etc., have been provided for the chemical study of processes.

STUDY OF THE PRINCIPLES OF PRESERVING FISH WITH SALT.

Without waiting for the completion of the fishery products laboratory, the Bureau immediately made arrangements for the initiation of various investigations, one of which concerns the preservation of fish with salt. The primary object of this investigation was to determine whether this useful method of preserving is necessarily limited to the cooler regions of the country and to a few species or whether it could by improvement be extended to other regions and other fishes. A number of fundamental questions are involved in the solution of this problem, namely, the factors influencing the rate of penetration of brine, the maximum temperature at which salting is successful, the mode of application of the salt, the effect of impurities in the salt, the rate and nature of the decomposition which takes place in tissues before the salt reaches them, the influence of the skin, fat, dressing, and cleaning, the amount of nutrients and water removed, etc. Various brands of commercial salt were compared with chemically pure salt as a standard. In the absence of proper laboratory facilities in the Washington office, the work was initiated in cooperation with the National Research Council at Johns Hopkins University Medical School, Baltimore, Md., and Dr. E. V. McCollum very kindly volunteered to supervise the experimental work done at that institution.

Significant results were attained within a few months, it being shown that the impurities in salt, even in small quantities, have a marked effect on the process of salting and on the quality of the salted product. In these experiments, squeteague were used. Pure sodium chloride penetrates the fish very rapidly and completely and produces a soft, yellow-meated, flexible fish. Small amounts of calcium chloride and magnesium chloride retard the penetration of the sodium chloride, but produce a firmer, whiter fish than pure sodium chloride. As these are common, almost constant, impurities in salt, it would appear that they may interfere with the preservation of fish in warm climates, such as obtain in our Southern States. As indicated, these products also affect the quality and appearance of the product. Thus it may be possible not only to bring about a more rapid and complete brining of fish in a much shorter time but also to produce salt fish possessing almost any desired degree of hardness and whiteness. Data were also sought as to the relative merits of the two methods of salting fish in brine or in dry salt, the amount and rate of decomposition of protein into the end product, amino-acid nitrogen, being determined. These experiments indicated that the dry-salting method is the more efficient at the higher temperatures.

Experiments in progress include the study of penetration of salt through the skin of the fish, as influenced by the impurities in the

salt, relation of freshness of fish to temperature at which it can be salted, determination of highest temperature at which it is practicable to salt fish, possible ways of improving methods in common practice, and trials of relative values of the different kinds of salt on the market.

EXPERIMENTS IN THE PREPARATION OF FISHERY PRODUCTS FOR THE TABLE.

Supplementing the work of the field agents engaged in giving lectures and practical demonstrations of the best methods for cooking fish, the Bureau equipped an experimental kitchen and employed experts to determine the best methods of preparation of new or little-known fish and fishery products for the table.

Here a considerable number of fishery products were tried out by various individual methods of preparation, and those best suited to the particular product selected. In some cases this information was furnished direct to the trade, in others it was assembled and published in economic circulars to aid in educating the public as to the merits of, and establishing larger markets for, such heretofore little-used products. In this manner assistance has been given in increasing the production and consumption of grouper, menhaden, mussels, sharks, tullibees, and the roe and buckroe of fishes.

In addition, the assemblage of materials for a cookbook on fish was begun. This is now nearing completion, many of the recipes being tested in the experimental kitchen.

NEW ENGLAND VESSEL FISHERIES.

The vessel fisheries centering at Boston and Gloucester, Mass., and Portland, Me., have been in a more than usually prosperous condition during the past year, notwithstanding the presence of enemy submarines along the coast and on the fishing grounds in the summer and the consequent loss of a number of fishing vessels. There was a decline in the total number of trips, but a considerable increase in the quantity and value of the products landed. The decline in the number of trips occurred at Boston and Portland, while there was an increase over the previous year at Gloucester. Statistics of these fisheries have been collected during the year by the local agents and published in monthly bulletins, showing, by species and fishing grounds, the quantities and values of fishery products landed by American and Canadian fishing vessels during the year at these ports. Two annual bulletins also have been issued, one showing the catch by months and the other by fishing grounds.

The fishing fleet which landed fishery products at these ports during the calendar year 1918 included 521 sail, steam, and gasoline screw vessels. These vessels landed at Boston 2,830 trips, aggregating 109,476,041 pounds of fish, valued at $6,587,754; at Gloucester, 3,414 trips, aggregating 74,175,499 pounds, valued at $3,062,605; and at Portland, 2,506 trips, aggregating 21,849,613 pounds, valued at $881,189. The total for the three ports amounted to 8,750 trips, aggregating 205,501,153 pounds of fresh and salted fish, having a value to the fishermen of $10,531,548. This total includes 60 trips landed at these ports by 21 Canadian fishing vessels, amounting to

5,602,749 pounds of fresh fish, valued at $218,625. These fish were landed in accordance with an arrangement with the Canadian Government, as an emergency war measure granting reciprocal privileges to fishing vessels, by which Canadian fishing vessels were permitted to land their fares at American ports direct from the fishing grounds. Canadian fishing vessels began to utilize this privilege in April and continued during the remainder of the year. The greater part of these fish, or 4,668,620 pounds, valued at $164,946, were landed at Portland.

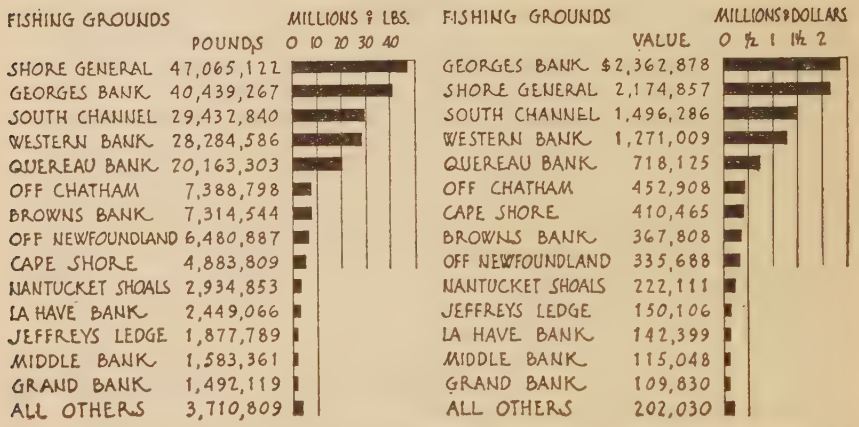


FIG. 1.—Quantities and values of fish landed by fishing vessels at Boston and Gloucester, Mass., and Portland, Me., in 1918, shown by fishing grounds.

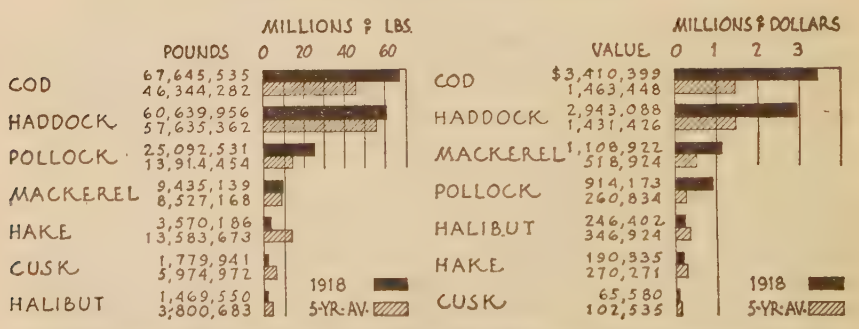


FIG. 2.—Quantities and values of the principal kinds of fish landed by fishing vessels at Boston and Gloucester, Mass., in 1918, compared with the five-year average, 1912–1916.

Compared with the previous year there was a decrease of 534 trips in the total number for the three ports, but an increase of 30,070,567 pounds, or 17.14 per cent, in the quantity, and of $2,170,216, or 25.95 per cent, in the value of the fish landed. The cod catch increased 15,357,899 pounds, or 27.19 per cent, in quantity, and $1,246,371, or 52.57 per cent, in value; haddock, 13,116,706 pounds, or 24.49 per cent, in quantity, and $682,547, or 27.12 per cent, in value; pollock, 12,052,828 pounds, or 83.07 per cent, in quantity, and $382,817, or 66.08 per cent, in value; halibut, 14,940 pounds, or 0.84 per cent, in quantity, and $83,048, or 37.88 per cent, in value; herring, 1,858,398 pounds, or 14.44 per cent, in quantity, and $162,068, or 54.27 per

cent, in value; and miscellaneous products, 309,709 pounds, or 7.88 per cent, in quantity, and $56,390, or 45.05 per cent, in value. There was also a considerable decrease in the catches of a number of species. The catch of hake decreased 2,633,817 pounds, or 33.27 per cent, in quantity, and $68,300, or 20 per cent, in value; cusk, 891,043 pounds, or 25.10 per cent, in quantity, and $16,083, or 13.50 per cent, in value; mackerel, 7,283,596 pounds, or 41.75 per cent, in quantity, and $265,195, or 18.23 per cent, in value; swordfish, 937,427 pounds, or 47.60 per cent, in quantity, and $68,977, or 23.60 per cent, in value. The Newfoundland herring catch fell off 422,932 pounds, or 6.21 per cent, in quantity, but increased $104,072, or 45.68 per cent, in value. The quantity of tilefish landed at Boston during the year declined from 1,211,450 pounds, valued at $44,743 in 1917, to 299,420 pounds, valued at $20,246 in 1918.

The following tables present in detail, by fishing grounds and by months, the products landed at Boston and Gloucester, Mass., and Portland, Me., by American and Canadian fishing vessels, for the calendar year 1918. The weights of fresh and salted fish given in these statistics represent the fish as landed from the vessels, and the values are those received by the fishermen. The grades, or sizes, given for certain species are those recognized in the trade.

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN AND CANADIAN FISHING VESSELS DURING THE CALENDAR YEAR 1918, SHOWN BY FISHING GROUNDS.

Fishing grounds.	Number of trips.	Cod.											
		Large (10 pounds and over).				Market (under 10 and over 2½ pounds).				Scrod (1 to 2½ pounds).			
		Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.	
		Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value*	*Pounds.*	*Value.*
LANDED AT BOSTON.													
East of 66° W. longitude.													
By American vessels:													
La Have Bank	31	366,795	$27,236			354,655	$18,015			67,745	$1,627		
Western Bank	180	3,854,620	255,378			2,466,376	111,026			85,077	2,457		
Quereau Bank	6	95,050	5,072			102,090	4,498			2,990	84		
Grand Bank	2	2,500	186			500	16						
St. Peters Bank	2	50,000	2,330			15,000	525						
Off Newfoundland	1							35,000	$1,400				
Cape Shore	62	289,672	22,409			322,479	15,646			53,328	1,296		
Gulf of St. Lawrence	1	6,100	390			500	25						
St. Anns Bank	1	4,285	328			31,000	1,575						
Roseway Bank	1	8,600	396			9,185	291			2,270	35		
By Canadian vessels:													
La Have Bank	1	4,200	312			9,385	384			210	4		
Western Bank	1	3,000	248			10,350	533			2,255	61		
Cape Shore	1	3,510	489			3,900	262			2,400	60		
West of 66° W. longitude.													
By American vessels:													
Browns Bank	105	1,292,415	78,559			873,050	42,131			152,472	4,291		
Georges Bank	648	12,331,918	772,387			3,693,757	189,301			189,134	4,477		
Cashes Bank	5	21,825	1,969			15,480	788			3,470	70		
Clark Bank	1	5,800	406			19,000	839			400	8		
Fippenies Bank	4	14,890	1,711			9,140	738			3,400	81		
Middle Bank	92	99,703	10,387			76,739	5,298			18,927	520		
Jeffreys Ledge	139	134,961	10,994			72,673	6,126			17,560	604		
South Channel	440	1,686,304	137,907			2,086,176	108,269			347,780	8,264		
Nantucket Shoals	105	273,826	25,827			1,029,647	51,748			135,968	3,394		
Off Chatham	270	1,096,836	83,301			1,123,608	60,423			279,059	5,946		
Bay of Fundy	3	8,700	485			34,025	1,148			1,100	22		
Seal Island	1	5,600	336			12,500	500			950	19		
South	24					395	4						
Shore, general	679	91,281	7,624			122,117	7,508			15,141	383		

By Canadian vessels:													
Browns Bank	14	78,980	5,499			138,720	6,225			12,825	295		
Georges Bank	10	17,715	1,046			42,530	1,733			2,565	57		
Total	2,830	21,849,086	1,453,212			12,674,977	635,575	35,000	1,400	1,397,026	34,055		
LANDED AT GLOUCESTER.													
East of 66° W. longitude.													
By American vessels:													
La Have Bank	11	195,290	7,829	2,285	$183	63,525	2,270	3,130	235	6,420	127	300	$20
Western Bank	67	1,998,531	80,674	406,970	27,414	1,066,315	36,526	293,559	18,406	47,000	976	20,675	1,085
Quereau Bank	133	6,310,423	222,937	1,125,628	77,805	7,916,279	242,893	917,591	56,205	246,933	4,888	68,322	4,402
Green Bank	1	45,275	1,698	19,770	1,334	2,470	80	2,980	186			60	3
Grand Bank	16	447,625	16,370	350,500	29,011	105,030	3,208	158,703	13,216	4,795	96	25,815	2,383
St. Peters Bank	4	261,170	9,238	23,130	1,806	177,955	5,372	9,705	658	200	4		
Off Newfoundland	29												
Cape Shore	31	6,575	247			4,420	144			475	10		
Gulf of St. Lawrence	2	74,500	2,915			94,450	3,307			9,940	200		
St. Anns Bank	1	2,350	106			17,350	694			1,130	23		
The Gully	1	9,900	396			910	32			175	7		
By Canadian vessels: Western Bank	1	17,955	1,011			19,985	749			825	17		
West of 66° W. longitude.													
By American vessels:													
Browns Bank	24	1,149,355	45,602			384,712	12,886			26,950	536		
Georges Bank	116	3,481,270	144,948			878,017	31,110			31,765	712		
Middle Bank	1												
Nantucket Shoals	10												
Seal Island	5	94,235	3,534			62,255	2,023						
Shore, general	2,961	2,964,812	163,756	16,765	1,174	12,983	423	965	55			63	2
Total	3,414	17,059,266	701,261	1,945,048	138,727	10,806,656	341,717	1,386,633	88,961	376,608	7,596	115,235	7,895
LANDED AT PORTLAND.													
East of 66° W. longitude.													
By American vessels:													
La Have Bank	7	37,730	1,660			26,875	956			4,320	82		
Western Bank	14	557,555	18,210			12,775	485			660	13		
Quereau Bank	1	48,900	1,467										
Green Bank	1												
Grand Bank	4	6,290	252	1,610	113	1,815	64	590	39				
St. Peters Bank	2												
Cape Shore	7												

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN AND CANADIAN FISHING VESSELS DURING THE CALENDAR YEAR 1918, SHOWN BY FISHING GROUNDS—Continued.

Fishing grounds.	Number of trips.	Cod.											
		Large (10 pounds and over).				Market (under 10 and over 2½ pounds).				Scrod (1 to 2½ pounds).			
		Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.	
LANDED AT PORTLAND—contd.													
East of 66° W. longitude—Contd.													
By Canadian vessels:		*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
La Have Bank	3	30,120	$1,908			5,130	$186			65	$1		
Western Bank	16	750,216	24,929			422,749	13,153						
Off Newfoundland	1	1,000	30			7,900	237			2,100	64		
Cape Shore	11	37,820	1,868			63,065	2,387			5,135	114		
West of 66° W. longitude.													
By American vessels:													
Browns Bank	1	5,625	225			4,810	144			2,600	39		
Georges Bank	7	76,700	3,560			15,750	618			1,205	24		
Cashes Bank	39	135,513	8,574			59,182	2,690			13,597	411		
Fippenies Bank	1	1,840	64			1,885	47			650	10		
Platts Bank	25	57,377	4,811			37,151	1,897			6,348	159		
Jeffreys Ledge	67	43,350	3,993			44,550	3,222			12,802	480		
Shore, general	2,298	954,136	71,454	495	$50	534,731	31,357	1,122	$107	130,508	4,366	1,115	$60
By Canadian vessels: Seal Island	1	1,485	66			4,035	137			910	23		
Total	2,506	2,745,657	143,071	2,105	163	1,242,403	57,580	1,712	146	185,900	5,786	1,115	60
Grand total	8,750	41,654,009	2,297,544	1,947,153	138,890	24,724,036	1,034,872	1,423,345	90,507	1,959,534	47,437	116,350	7,955

Fishing grounds.	Haddock.								Hake.							
	Large (over 2½ pounds).				Scrod (1 to 2½ pounds).				Large (6 pounds and over).				Small (under 6 pounds).			
	Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.	
LANDED AT BOSTON.																
East of 66° W. longitude.																
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
By American vessels:																
La Have Bank	526,575	$31,146			70,715	$2,653			56,150	$3,121			56,501	$2,314		
Western Bank	6,628,872	296,602			1,224,120	43,041			24,305	1,252			69,955	3,158		
Quereau Bank	4,550	181											2,900	145		
Grand Bank	43,000	1,330											15,500	873		
St. Peters Bank	75,500	3,330														
Cape Shore	429,050	32,553			21,240	960			24,090	1,442			55,940	2,421		
Gulf of St. Lawrence	25,500	1,020											6,000	400		
St. Anns Bank	16,000	1,012														
Roseway Bank	4,250	206			1,000	25							1,340	40		
By Canadian vessels:																
La Have Bank	6,730	269														
Western Bank	24,500	1,694			26,250	1,017							200	16		
Cape Shore	12,400	558														
West of 66° W. longitude.																
By American vessels:																
Browns Bank	1,630,890	81,599			147,093	5,489			6,350	391			82,385	3,587		
Georges Bank	12,074,917	684,575			2,042,605	87,099			49,745	2,592			58,568	3,370		
Cashes Bank	9,230	483			2,980	65			3,155	206			15,480	628		
Clark Bank	32,000	1,220														
Fippenies Bank	19,675	1,771			670	34			2,710	304			13,045	805		
Middle Bank	559,225	43,050			20,015	910			101,597	10,074			428,799	23,610		
Jeffreys Ledge	483,870	49,135			32,030	2,073			20,013	2,352			146,620	11,141		
South Channel	19,620,165	970,040			2,238,395	72,947			575,088	35,535			651,431	33,299		
Nantucket Shoals	130,486	6,940			335	11			675	41			3,020	91		
Off Chatham	3,383,360	216,279			184,875	7,562			49,540	4,173			198,545	9,180		
Bay of Fundy	2,100	63							49,250	2,901			91,895	3,433		
Seal Island	38,000	1,615											1,230	49		
South	730	26											3,240	128		
Shore, general	169,923	10,948			9,190	433			24,225	3,265			112,628	5,001		
By Canadian vessels:																
Browns Bank	35,435	1,818			905	27			8,850	248						
Georges Bank	153,895	10,469			22,560	989							345	17		
Total	46,140,828	2,449,932			6,044,978	225,335			986,743	67,897			2,015,567	103,706		

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN AND CANADIAN FISHING VESSELS DURING THE CALENDAR YEAR 1918, SHOWN BY FISHING GROUNDS—Continued.

Fishing grounds.	Haddock.								Hake.							
	Large (over 2½ pounds).				Scrod (1 to 2½ pounds).				Large (6 pounds and over).				Small (under 6 pounds).			
	Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.	
LANDED AT GLOUCESTER.																
East of 66° W. longitude.																
By American vessels:	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Le Have Bank	103,348	$2,930							19,875	$563						
Western Bank	1,610,578	44,967	2,170	$92	45,700	$1,264			272,440	7,431	15,017	$617				
Quereau Bank	2,731,226	70,955	47,898	2,385			6,810	$238	54,333	1,467	11,545	418				
Grand Bank	16,550	416	2,475	154			8,829	618	14,375	433	3,180	170			460	$25
St. Peters Bank	154,545	3,965	310	14					20,530	594	3,920	176				
Cape Shore	3,690	92							7,870	197						
Gulf of St. Lawrence									2,885	87						
The Gully	70	2														
By Canadian vessels: Western Bank	27,435	970			44,090	1,102			1,425	46						
West of 66° W. longitude.																
By American vessels:																
Browns Bank	342,065	10,695			10,535	485			850	21						
Georges Bank	2,223,175	70,985			361,265	11,957			55,495	1,517			150	$3		
Seal Island	625	16							37,385	1,030						
Shore, general	710,761	43,519							46,036	3,933	105	4				
Total	7,924,068	249,512	52,853	2,645	461,590	14,808	15,639	856	533,499	17,319	33,767	1,385	150	3	460	25
LANDED AT PORTLAND.																
East of 66° W. longitude.																
By American vessels:																
La Have Bank	81,055	3,784			5,585	138			1,615	125			4,840	240		
Western Bank	1,479,420	46,731											8,505	213		
Quereau Bank	97,800	2,934														
Grand Bank									540	16	740	33				
St. Peters Bank	13,250	596			200	4										

By Canadian vessels:																
La Have Bank	1,130	35							5,455	327			2,205	88		
Western Bank	2,759,597	92,009											1,180	30		
Off Newfoundland	31,200	1,326							300	9			2,900	87		
Cape Shore	228,375	9,088			5,785	116			13,970	499			24,930	787		
West of 66° W. longitude.																
By American vessels:																
Browns Bank	24,000	780			4,020	131										
Georges Bank	29,850	1,440			2,180	55			1,000	50			2,435	79		
Cashes Bank	14,170	972			1,250	48			19,615	1,101			33,659	1,178		
Fippenies Bank	860	43			300	9							145	5		
Platts Bank	34,477	2,687			1,635	57			21,351	1,621			70,149	3,107		
Jeffreys Ledge	296,712	26,801			19,830	1,003			16,894	1,435			129,545	6,267		
Shore, general	860,175	63,611			30,949	1,477			233,296	17,280			1,115,374	48,173		
By Canadian vessels: Seal Island	7,460	305			320	8										
Total	5,959,531	253,142			72,054	3,046			314,036	22,463	740	23	1,395,867	60,254		
Grand total	60,024,427	2,952,586	52,853	2,645	6,578,622	243,189	15,639	856	1,834,278	107,679	34,507	1,418	3,411,584	163,963	460	25

Fishing grounds.	Pollock.				Cusk.				Halibut.			
	Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.	
LANDED AT BOSTON.												
East of 66° W. longitude.												
By American vessels:	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
La Have Bank	32,915	$2,074			76,235	$3,391			19,273	$4,566		
Western Bank	615,275	26,959			122,071	4,747			90,655	21,429		
Quereau Bank	9,850	340			1,940	63			4,890	716		
Grand Bank					300	9			20,000	3,000		
St. Peters Bank									2,262	515		
Cape Shore	17,950	1,020			85,805	2,846			20,829	4,815		
St. Anns Bank	200	8							50	12		
Roseway Bank	990	30			12,030	283			394	74		
By Canadian vessels:												
La Have Bank	708	49			5,675	193			690	116		
Western Bank	20,275	917							260	134		
Cape Shore	900	41			2,025	51			41	6		

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN AND CANADIAN FISHING VESSELS DURING THE CALENDAR YEAR 1918, SHOWN BY FISHING GROUNDS—Continued.

Fishing grounds.	Pollock.				Cusk.				Halibut.			
	Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.	
LANDED AT BOSTON—continued.												
West of 66° W. longitude.												
By American vessels:	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Browns Bank	171,070	$9,163			317,136	$12,316			93,087	$13,611		
Georges Bank	524,333	31,458			138,847	6,495			326,780	56,536		
Cashes Bank	3,690	236			34,400	1,405			513	137		
Clark Bank	1,800	72							1,586	367		
Fippenies Bank	6,885	414			10,485	523			92	39		
Middle Bank	45,565	4,018			85,452	3,949			4,559	1,431		
Jeffreys Ledge	116,550	8,728			70,947	4,067			1,925	531		
South Channel	1,061,506	65,102			31,515	1,028			69,307	14,783		
Nantucket Shoals	181,821	9,109			1,710	54			9,321	1,561		
Off Chatham	698,802	42,824			20,085	803			12,774	2,689		
Bay of Fundy	7,960	296			12,520	387			543	122		
Seal Island	2,000	80			9,835	344			797	209		
South	1,070	37										
Shore, general	718,951	45,148			21,770	836			2,115	447		
By Canadian vessels:												
Browns Bank	35,925	1,241			23,010	717			3,472	687		
Georges Bank	14,480	605			4,610	175			620	121		
Total	4,291,471	250,269			1,088,403	44,682			686,955	134,654		
LANDED AT GLOUCESTER.												
East of 66° W. longitude.												
By American vessels:												
La Have Bank	10,685	273	100	$5	32,220	957	535	$32	42,857	5,659		
Western Bank	171,515	4,561	26,345	1,077	218,799	6,595	12,530	522	333,257	49,972	787	$94
Quereau Bank	178,745	4,641	26,568	999	63,260	1,827	340	19	75,538	9,673	7,239	799
Green Bank									10,410	1,423		
Grand Bank	845	20	210	9	765	22	435	20	167,966	21,506	2,905	347
St. Peters Bank	10,170	255	35	2	1,660	54			8,087	998		
Cape Shore	325	8			3,655	100						
The Gully	85	2							17,480	2,603		
By Canadian vessels: Western Bank	24,365	871							86	32		

West of 66° W. longitude.												
By American vessels:												
Browns Bank	45,880	1,045			49,345	1,534			1,178	189		
Georges Bank	48,055	1,359			171,417	5,162			70,954	11,516		
Seal Island	7,305	180			119,757	3,571						
Shore, general	20,249,827	648,597			16,720	483			43,851	6,937		
Total	20,747,802	661,812	53,258	2,092	677,598	20,305	13,940	593	771,664	110,508	10,931	1,240
LANDED AT PORTLAND.												
East of 66° W. longitude.												
By American vessels:												
La Have Bank	2,630	89			12,925	443			34,526	7,707		
Western Bank	42,138	982			5,915	164			24,683	4,506		
Quereau Bank	1,900	29										
Green Bank									18,144	460		
Grand Bank					370	11			86,721	15,817		
St. Peters Bank									75,289	13,929		
By Canadian vessels:												
La Have Bank	9,080	228			5,140	169			16,710	3,319		
Western Bank	66,801	1,281			11,230	281			15,053	2,325		
Off Newfoundland	12,035	361							1,628	301		
Cape Shore	5,095	179			52,955	1,896			7,580	982		
West of 66° W. longitude.												
By American vessels:												
Browns Bank	720	18			1,145	29			914	180		
Georges Bank	640	23			4,550	162			4,762	1,032		
Cashes Bank	25,380	932			253,495	9,142			3,412	770		
Fippenies Bank	390	10			1,870	42			123	25		
Platts Bank	10,443	498			66,280	2,326			3,254	641		
Jeffreys Ledge	25,430	1,401			66,979	3,573			2,400	515		
Shore, general	1,265,257	41,877			392,565	19,135			18,030	3,327		
By Canadian vessels: Seal Island	150	4			2,900	78			225	42		
Total	1,468,089	47,912			878,319	37,451			311,454	55,878		
Grand total	26,507,362	959,993	53,258	2,092	2,644,320	102,438	13,940	593	1,770,073	301,040	10,931	1,240

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN AND CANADIAN FISHING VESSELS DURING THE CALENDAR YEAR 1918, SHOWN BY FISHING GROUNDS—Continued.

Fishing grounds.	Mackerel.											
	Large (over 2¼ pounds).				Medium (1½ to 2¼ pounds).				Small (under 1½ pounds).			
	Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
LANDED AT BOSTON.												
East of 66° W. longitude.												
By American vessels: Cape Shore	1,366,554	$125,287	66,000	$6,930	4,485	$135						
West of 66° W. longitude.												
By American vessels:												
Georges Bank	20,000	3,000			20,000	3,000						
Middle Bank					41,385	6,783						
Jeffreys Ledge					11,298	970						
South Channel					264,180	12,510						
Nantucket Shoals	930,938	111,896										
Off Chatham	32,045	5,369			2,270	250			500	$20		
South	211,693	30,717										
Shore, general	2,434,596	273,172	108,400	17,058	917,712	147,861	30,220	$1,479	307,927	31,267	9,400	$1,504
Total	4,995,826	549,741	174,400	23,988	1,261,360	171,509	30,220	4,479	308,427	31,287	9,400	1,504
LANDED AT GLOUCESTER.												
East of 66° W. longitude.												
By American vessels: Cape Shore	43,230	4,435	1,260,563	134,733								
West of 66° W. longitude.												
By American vessels:												
Georges Bank			56,500	11,303							200	27
Middle Bank							1,600	267				
Nantucket Shoals			5,600	934	128,710	2,824	19,000	2,126	200	27		
Shore, general	55,742	9,056	51,895	8,329	111,991	9,746	891,575	138,726			25,700	3,881
Total	98,972	13,491	1,374,558	155,299	243,701	12,570	912,175	141,119	200	27	25,900	3,908

LANDED AT PORTLAND.												
East of 66° W. longitude.												
By American vessels: Cape shore	172,185	12,764	48,200	4,820								
By Canadian vessels: Cape Shore	29,152	2,423										
West of 66° W. longitude.												
By American vessels: Shore, general	242,406	34,124	1,200	168	106,241	14,345			123,944	11,358		
Total	443,743	49,311	49,400	4,988	106,241	14,345			123,944	11,358		
Grand total	5,538,541	612,543	1,598,358	184,275	1,611,302	198,424	942,395	145,598	432,571	42,672	35,300	5,412

Fishing grounds.	Miscellaneous.				Total.				Grand total.	
	Fresh.		Salted.		Fresh.		Salted.			
LANDED AT BOSTON.										
East of 66° W. longitude.										
By American vessels:	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
La Have Bank	19,955	$1,124			1,647,514	$97,267			1,647,514	$97,267
Western Bank	163,168	7,686			15,344,494	773,735			15,344,494	773,735
Quereau Bank	765	31			225,025	11,130			225,025	11,130
Grand Bank					81,800	5,414			81,800	5,414
St. Peters Bank					142,762	6,700			142,762	6,700
Off Newfoundland	[a]80,000	5,600			80,000	5,600	35,000	$1,400	115,000	7,000
Cape Shore	63,018	10,842			2,754,440	221,672	66,000	6,930	2,820,440	228,602
Gulf of St. Lawrence	3,000	186			41,100	2,021			41,100	2,021
St. Anns Bank	1,800	72			53,335	3,007			53,335	3,007
Roseway Bank	1,000	40			41,059	1,420			41,059	1,420
By Canadian vessels:										
La Have Bank					27,598	1,327			27,598	1,327
Western Bank					87,090	4,620			87,090	4,620
Cape Shore	230	12			25,406	1,479			25,406	1,479
West of 66° W. longitude.										
By American vessels:										
Browns Bank	144,720	18,596			4,910,668	276,033			4,910,668	276,033
Georges Bank	1,138,079	194,272			32,599,683	2,038,562			32,599,683	2,038,562
Cashes Bank	3,180	160			113,433	6,147			113,433	6,147
Clark Bank	1,600	48			62,186	2,960			62,186	2,960
Fippenies Bank	2,865	154			83,857	6,574			83,857	6,574

[a] For footnote see page 25.

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN AND CANADIAN FISHING VESSELS DURING THE CALENDAR YEAR 1918, SHOWN BY FISHING GROUNDS—Continued.

Fishing grounds.	Miscellaneous.				Total.				Grand total.	
	Fresh.		Salted.		Fresh.		Salted.			
LANDED AT BOSTON—continued.										
West of 66° W. longitude—Continued.										
By American vessels—Continued.	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Middle Bank	99,795	$4,751			1,581,761	$114,781			1,581,761	$114,781
Jeffreys Ledge	87,022	3,924			1,195,469	100,645			1,195,469	100,645
South Channel	800,903	36,602			29,432,840	1 496,286			29,432,840	1,496,286
Nantucket Shoals	83,596	5,528			2,781,343	216,200			2,781,343	216,200
Off Chatham	306,499	14,089			7,388,798	452,908			7,388,798	452,908
Bay of Fundy	9,100	397			217,193	9,254			217,193	9,254
Seal Island	2,800	168			73,712	3,320			73,712	3,320
South	315,220	20,681			532,348	51,593			532,348	51,593
Shore, general	2,096,632	70,080			7,044,238	604,273	148,020	$23,041	7,192,258	627,314
By Canadian vessels:										
Browns Bank	10,080	454			348,202	17,211			348,202	17,211
Georges Bank	50,347	9,032			309,667	24,244			309,667	24,244
Total	5,485,374	401,529			109,227,021	6,556,383	249,020	31,371	109,476,041	6,587,754
LANDED AT GLOUCESTER.										
East of 66° W. longitude.										
By American vessels:										
La Have Bank					474,220	20,608	6,350	475	480,570	21,083
Western Bank					5,764,135	232,966	778,053	49,307	6,542,188	282,273
Quereau Bank					17,576,737	559,281	2,212,041	143,270	19,788,778	702,551
Green Bank					58,155	3,201	22,810	1,523	80,965	4,724
Grand Bank					757,951	42,071	553,512	45,953	1,311,463	88,024
St. Peters Bank					634,317	20,480	37,100	2,656	671,417	23,136
Off Newfoundland	a 81,800	4,908	a 6,225,024	$321,365	81,800	4,908	6,225,024	321,365	6,306,824	326,273
Cape Shore					70,240	5,233	1,260,563	134,733	1,330,803	139,966
Gulf of St. Lawrence					181,775	6,509			181,775	6,509
St. Anns Bank					20,830	823			20,830	823
The Gully					28,620	3,042			28,620	3,042
By Canadian vessels: Western Bank					136,166	4,798			136,166	4,798
West of 66° W. longitude.										
By American vessels:										
Browns Bank					2,010,870	72,993			2,010,870	72,993

Georges Bank					7,321,563	279,269	56,700	11,330	7,378,263	290,599
Middle Bank							1,600	267	1,600	267
Nantucket Shoals					128,910	2,851	21,600	3,060	153,510	5,911
Seal Island					321,562	10,354			321,562	10,354
Shore, general	2,218,904	40,494	a7,600	164	26,434,627	926,944	994,668	152,335	27,429,295	1,079,279
Total	2,300,704	45,402	6,232,624	321,529	62,002,478	2,196,331	12,173,021	866,274	74,175,499	3,062,605
LANDED AT PORTLAND.										
East of 66° W. longitude										
By American vessels:										
La Have Bank	920	132			213,021	15,356			213,021	15,356
Western Bank	5,970	143			2,137,621	71,447			2,137,621	71,447
Quereau Bank	900	14			149,500	4,444			149,500	4,444
Green Bank					18,144	460			18,144	460
Grand Bank	180	47			95,916	16,207	2,940	185	98,856	16,392
St. Peters Bank					86,739	14,529			86,739	14,529
Cape Shore	12,693	2,487			184,878	15,251	48,200	4,820	233,078	20,071
By Canadian vessels:										
La Have Bank	5,328	1,105			80,363	7,366			80,363	7,366
Western Bank	10,201	128			4,037,027	134,136			4,037,027	134,136
Off Newfoundland					59,063	2,415			59,063	2,415
Cape Shore	220	8			474,082	20,347			474,082	20,347
West of 66° W. longitude.										
By American vessels:										
Browns Bank	970	25			44,804	1,571			44,804	1,571
Georges Bank	12,582	2,430			151,654	9,473			151,654	9,473
Cashes Bank	37,455	794			601,728	26,612			601,728	26,612
Fippenies Bank					8,063	255			8,063	255
Platts Bank	3,431	104			311,896	17,908			311,896	17,908
Jeffreys Ledge	23,828	771			682,320	49,461			682,320	49,461
Shore, general	6,432,025	105,995			12,439,637	467,879	3,932	385	12,443,569	468,264
By Canadian vessels: Seal Island	600	19			18,085	682			18,085	682
Total	6,547,303	114,202			21,794,541	875,799	55,072	5,390	21,849,613	881,189
Grand total	14,333,381	564,133	6,232,624	321,529	193,024,040	9,628,513	12,477,113	903,035	205,501,153	10,531,548

a Herring. Other items under "Miscellaneous" include alewives, 97 pounds, value $2; bluebacks, 16,905 pounds, value $696; bluefish, 4 pounds, value $1; bonito, 2,100 pounds, value $210; butterfish, 19,257 pounds, value $2,053; catfish or wolf fish, 233,371 pounds, value $7,768; eels, 1,620 pounds, value $88; flounders, 2,269,807 pounds, value $93,800; goosefish, 1,210 pounds, value $18; herring, 8,602,538 pounds, value $128,645; redfish, 160,889 pounds, value $4,363; salmon, 288 pounds, value $59; shad, 29,807 pounds, value $2,984; sharks, 55,906 pounds, value $1,754; skates, 179,726 pounds, value $3,958; smelt, 27,535 pounds, value $2,978; sturgeon, 4,857 pounds, value $435; swordfish, 1,034,091 pounds, value $223,192; tilefish, 299,420 pounds, value $20,246; whiting, 10,460 pounds, value $100; blackfish, 200 pounds, value $2; porpoise, 175 pounds, value $3; lobster, 502 pounds, value $119; squid, 100 pounds, value $6; livers, 1,120,331 pounds, value $52,363; sounds, 13,704 pounds, value $795; spawn, 83,166 pounds, value $6,790; and tongues, 3,515 pounds, value $197.

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN AND CANADIAN FISHING VESSELS DURING THE YEAR 1918, SHOWN BY MONTHS.

Months.	Number of trips.	Cod.											
		Large (10 pounds and over).				Market (under 10 and over 2½ pounds).				Scrod (1 to 2½ pounds).			
		Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.	
LANDED AT BOSTON.		*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
January	130	701,631	$63,935	.....	.....	623,320	$40,452	.....	.....	172,201	$4,954	.....	.....
February	167	3,112,655	231,856	.....	.....	533,886	41,727	.....	.....	72,720	2,250	.....	.....
March	239	3,488,862	210,086	.....	.....	672,728	36,275	.....	.....	61,784	1,585	.....	.....
April	193	3,982,163	184,645	.....	.....	720,936	28,631	35,000	$1,400	59,078	1,249	.....	.....
May	265	2,187,848	107,883	.....	.....	1,398,439	52,877	.....	.....	160,954	3,844	.....	.....
June	224	1,339,123	92,171	.....	.....	1,502,970	69,902	.....	.....	150,343	3,273	.....	.....
July	337	1,413,700	97,351	.....	.....	1,933,329	91,230	.....	.....	143,452	3,183	.....	.....
August	367	1,413,906	105,432	.....	.....	1,421,162	71,707	.....	.....	187,554	5,014	.....	.....
September	269	1,207,809	108,218	.....	.....	1,305,888	69,963	.....	.....	176,857	3,802	.....	.....
October	250	886,512	78,668	.....	.....	832,055	45,354	.....	.....	83,855	1,641	.....	.....
November	231	1,171,679	86,881	.....	.....	925,755	42,910	.....	.....	63,833	1,417	.....	.....
December	158	943,198	86,086	.....	.....	804,509	44,547	.....	.....	64,395	1,843	.....	.....
Total	2,830	21,849,086	1,453,212	.....	.....	12,674,977	635,575	35,000	1,400	1,397,026	34,055	.....	.....
LANDED AT GLOUCESTER.													
January	171	25,589	2,642	.....	.....	5,340	267	.....	.....	3,210	32	.....	.....
February	86	158,302	12,114	.....	.....	20,760	1,322	.....	.....	2,340	78	.....	.....
March	411	1,169,496	59,542	.....	.....	186,515	6,963	.....	.....	2,545	50	.....	.....
April	492	4,611,343	196,271	12,530	$877	614,699	20,802	10,025	577	29,425	614	80	$3
May	441	3,324,958	126,267	16,345	1,062	2,463,628	79,710	33,963	1,868	72,105	1,444	.....	.....
June	170	2,546,326	91,748	722,985	47,691	2,687,531	81,500	555,448	33,304	89,391	1,769	27,250	1,471
July	128	2,135,997	78,088	493,903	31,958	2,360,963	72,257	359,668	20,495	83,272	1,631	39,882	2,246
August	77	1,535,690	54,450	165,860	11,438	1,619,180	48,692	120,816	7,538	48,385	968	4,935	287
September	76	682,275	25,007	380,475	30,431	508,340	16,801	181,220	13,592	24,210	540	8,330	586
October	308	283,527	21,271	125,775	12,552	44,465	1,626	98,038	8,979	2,500	84	23,000	2,185
November	647	427,532	22,410	27,175	2,718	249,360	9,906	27,455	2,608	14,330	288	11,758	1,117
December	407	158,231	11,451	.....	.....	45,875	1,871	.....	.....	4,895	98	.....	.....
Total	3,414	17,059,266	701,261	1,945,048	138,727	10,806,656	341,717	1,386,633	88,961	376,608	7,596	115,235	7,895

LANDED AT PORTLAND.													
January	125	51,613	6,283			75,532	7,938			24,684	1,678		
February	125	81,336	5,755			68,573	5,144			12,982	616		
March	234	143,628	7,448	1,610	113	79,590	4,131	590	39	15,897	423		
April	221	362,463	14,031			136,999	4,316			32,490	525		
May	346	340,156	11,913			284,922	9,158			13,132	212		
June	318	547,840	20,204			20,339	902			5,010	96		
July	152	610,213	27,986			24,544	1,350			5,398	173		
August	162	207,625	13,671			241,435	8,059			6,769	140		
September	173	93,328	8,120	495	50	44,096	2,556	1,122	107	10,957	332	1,115	60
October	234	110,365	9,238			95,457	4,429			16,744	412		
November	217	105,404	8,773			79,586	3,791			15,393	385		
December	199	91,686	9,649			91,330	5,776			26,144	794		
Total	2,506	2,745,657	143,071	2,105	163	1,242,403	57,580	1,712	146	185,900	5,786	1,115	60
Grand total	8,750	41,654,009	2,297,544	1,947,153	138,890	24,724,036	1,034,872	1,423,345	90,507	1,959,534	47,437	116,350	7,955
Grounds E. of 66° W. long	654	15,527,557	708,519	1,929,893	137,666	13,334,418	465,539	1,421,258	90,345	549,448	12,246	115,235	7,895
Grounds W. of 66° W. long	8,096	26,126,452	1,589,025	17,260	1,224	11,389,618	569,333	2,087	162	1,413,086	35,191	1,115	60
Landed at Boston in 1917	2,962	11,366,216	685,115			11,905,068	507,939			1,872,806	40,008		
Landed at Gloucester in 1917	3,074	9,983,851	357,420	2,894,581	149,756	10,168,146	270,762	3,327,379	157,573	420,291	5,038	279,406	10,226
Landed at Portland in 1917	3,248	2,452,959	122,029	63,420	3,499	1,386,475	52,685	8,905	428	317,025	8,356		

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN AND CANADIAN FISHING VESSELS DURING THE YEAR 1918, SHOWN BY MONTHS—Continued.

Months.	Haddock.								Hake.							
	Large (over 2½ pounds).				Scrod (1 to 2½ pounds).				Large (6 pounds and over).				Small (under 6 pounds).			
	Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.	
LANDED AT BOSTON.	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
January	2,516,592	$204,155	.....	.....	733,713	$39,962	.....	.....	5,063	$731	.....	.....	58,729	$5,268	.....	.....
February	3,739,185	271,190	.....	.....	753,005	34,332	.....	.....	3,050	357	.....	.....	30,876	2,669	.....	.....
March	4,658,010	288,361	.....	.....	784,125	33,915	.....	.....	3,145	335	.....	.....	40,885	2,516	.....	.....
April	3,501,365	128,652	.....	.....	542,875	14,507	.....	.....	2,260	181	.....	.....	16,560	752	.....	.....
May	3,036,590	123,604	.....	.....	721,820	13,740	.....	.....	48,560	2,898	.....	.....	120,475	4,566	.....	.....
June	2,174,983	127,129	.....	.....	458,355	15,824	.....	.....	25,175	1,221	.....	.....	44,420	1,922	.....	.....
July	3,344,996	149,799	.....	.....	368,405	11,348	.....	.....	158,723	8,456	.....	.....	139,045	7,964	.....	.....
August	4,204,206	186,969	.....	.....	205,780	7,033	.....	.....	183,475	9,718	.....	.....	244,168	11,663	.....	.....
September	5,985,043	258,267	.....	.....	426,353	13,179	.....	.....	191,819	13,607	.....	.....	195,102	10,944	.....	.....
October	5,075,598	240,521	.....	.....	424,725	14,369	.....	.....	160,915	12,208	.....	.....	358,358	16,872	.....	.....
November	4,516,580	225,772	.....	.....	296,862	9,837	.....	.....	156,901	12,331	.....	.....	449,089	17,253	.....	.....
December	3,387,680	245,513	.....	.....	328,960	17,289	.....	.....	47,657	5,854	.....	.....	317,860	21,317	.....	.....
Total	46,140,828	2,449,932	.....	.....	6,044,978	225,335	.....	.....	986,743	67,897	.....	.....	2,015,567	103,706	.....	.....
LANDED AT GLOUCESTER.																
January	43,288	3,284	.....	.....	.....	.....	.....	.....	24,752	2,953	.....	.....	.....	.....	.....	.....
February	55,322	4,538	.....	.....	14,320	732	.....	.....	6,302	469	.....	.....	150	3	.....	.....
March	794,639	33,857	.....	.....	175,235	6,209	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
April	1,720,958	54,053	.....	.....	181,865	5,493	.....	.....	1,340	34	185	$7	.....	.....	.....	.....
May	1,279,061	34,858	200	$8	380	8	.....	.....	19,763	494	877	31	.....	.....	.....	.....
June	391,568	10,337	14,110	622	.....	.....	.....	.....	47,820	1,225	10,130	355	.....	.....	.....	.....
July	1,208,374	31,261	20,545	924	.....	.....	6,810	$238	160,345	4,329	11,665	473	.....	.....	.....	.....
August	1,219,290	30,544	2,230	100	.....	.....	.....	.....	160,295	4,378	4,070	183	.....	.....	.....	.....
September	572,960	15,813	7,480	411	42,600	1,172	.....	.....	93,800	2,826	4,195	191	.....	.....	.....	.....
October	166,979	7,883	1,575	110	.....	.....	8,829	618	1,862	79	.....	.....	.....	.....	.....	.....
November	388,706	16,789	6,713	470	45,290	1,132	.....	.....	17,220	532	2,645	145	.....	.....	460	$25
December	82,923	6,295	.....	.....	1,900	62	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total	7,924,068	249,512	52,853	2,645	461,590	14,808	15,639	856	533,499	17,319	33,767	1,385	150	3	460	25

LANDED AT PORTLAND.																
January	68,551	9,442	.....	.....	5,479	435	.....	.....	4,183	493	.....	.....	21,059	1,537	.....	.....
February	213,117	20,720	.....	.....	10,687	610	.....	.....	2,606	271	.....	.....	34,041	2,114	.....	.....
March	141,946	10,420	.....	.....	5,976	283	.....	.....	12,937	936	740	33	65,615	3,376	.....	.....
April	803,893	30,755	.....	.....	10,604	311	.....	.....	20,020	1,074	.....	.....	30,231	863	.....	.....
May	1,197,719	41,899	.....	.....	9,112	220	.....	.....	11,588	597	.....	.....	60,598	1,864	.....	.....
June	1,451,422	44,339	.....	.....	1,312	39	.....	.....	11,989	655	.....	.....	48,601	1,681	.....	.....
July	754,062	26,786	.....	.....	433	18	.....	.....	11,153	664	.....	.....	38,096	1,586	.....	.....
August	600,551	21,335	.....	.....	219	10	.....	.....	20,341	1,180	.....	.....	80,124	2,912	.....	.....
September	33,497	1,927	.....	.....	1,053	46	.....	.....	67,848	5,875	.....	.....	267,678	13,237	.....	.....
October	276,854	13,814	.....	.....	9,813	371	.....	.....	78,860	5,631	.....	.....	407,054	15,270	.....	.....
November	176,345	11,115	.....	.....	5,151	186	.....	.....	55,767	3,368	.....	.....	206,455	7,449	.....	.....
December	241,574	20,590	.....	.....	12,215	517	.....	.....	16,744	1,719	.....	.....	136,315	8,365	.....	.....
Total	5,959,531	253,142	.....	.....	72,054	3,046	.....	.....	314,036	22,463	740	33	1,395,867	60,254	.....	.....
Grand total	60,024,427	2,952,586	52,853	2,645	6,578,622	243,189	15,639	856	1,834,278	107,679	34,507	1,418	3,411,584	163,963	460	25
Grounds E. of 66° W. long	17,136,196	650,701	52,853	2,645	1,444,685	50,320	15,639	856	520,158	17,609	34,402	1,414	252,896	10,812	460	25
Grounds W. of 66° W. long	42,888,231	2,301,885	.....	.....	5,133,937	192,869	.....	.....	1,314,120	90,070	105	4	3,158,688	153,151	.....	.....
Landed at Boston in 1917	34,042,297	1,788,206	.....	.....	11,474,315	395,211	.....	.....	1,314,469	72,879	.....	.....	3,665,866	157,661	.....	.....
Landed at Gloucester in 1917	2,585,187	92,977	159,493	4,899	64,715	699	600	16	733,856	21,555	72,202	2,241	1,570	56	.....	.....
Landed at Portland in 1917	4,981,768	225,784	.....	.....	246,460	8,910	.....	.....	374,655	22,527	880	34	1,749,139	64,346	2,009	86

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN AND CANADIAN FISHING VESSELS DURING THE YEAR 1918, SHOWN BY MONTHS—Continued.

Months.	Pollock.				Cusk.				Halibut.			
	Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.	
LANDED AT BOSTON.	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
January	92,987	$7,011			98,422	$5,312			6,396	$2,144		
February	138,712	11,801			65,957	3,726			38,017	10,251		
March	104,765	7,489			78,085	3,815			18,911	5,082		
April	173,530	7,793			84,694	2,897			30,946	7,179		
May	342,767	13,793			191,165	5,385			187,124	33,482		
June	313,422	15,682			48,495	1,703			66,297	9,751		
July	634,543	35,563			118,481	4,439			102,178	13,802		
August	733,714	50,077			44,817	2,373			64,337	11,587		
September	541,408	40,773			58,295	2,629			89,378	16,012		
October	525,035	29,133			93,255	3,768			31,408	7,999		
November	510,183	21,274			57,499	2,065			31,372	9,364		
December	180,405	9,880			149,238	6,570			20,591	8,001		
Total	4,291,471	250,269			1,088,403	44,682			686,955	134,654		
LANDED AT GLOUCESTER.												
January	297,166	27,069										
February	15,257	1,157			13,684	737			776	146		
March	255,719	14,519			22,725	784			12,184	2,061		
April	190,214	8,172	4,990	$115	36,460	706	390	$17	46,642	6,772		
May	1,208,102	28,358			151,547	4,130			84,707	14,623		
June	660,746	15,631	28,408	1,082	25,570	763	85	3	242,230	32,500	2,663	$276
July	104,412	2,833	14,360	646	207,736	6,893	11,005	443	219,843	31,481	3,625	412
August	90,630	2,257	5,310	239	105,420	2,848	1,880	95	75,915	10,036	85	7
September	38,270	1,045	190	10	77,406	2,266	580	35	84,383	12,091	4,500	540
October	5,817,544	176,473			23,175	729			4,898	766	40	3
November	7,220,356	216,921			10,220	327			86	32	18	2
December	4,849,386	167,377			3,655	122						
Total	20,747,802	661,812	53,258	2,092	677,598	20,305	13,940	593	771,664	110,508	10,931	1,240
LANDED AT PORTLAND.												
January	21,455	1,903			34,243	2,636			127	19		
February	20,380	1,752			31,795	2,435			9,119	2,145		
March	77,276	3,830			78,470	4,035			14,783	2,365		

April	144,592	4,156	.....	.....	180,826	5,164	.....	.....	16,460	2,493	.....	.....
May	184,174	4,163	.....	.....	56,272	1,501	.....	.....	9,276	1,728	.....	.....
June	334,912	5,920	.....	.....	25,738	1,000	.....	.....	49,603	8,168	.....	.....
July	189,270	5,377	.....	.....	58,925	2,889	.....	.....	16,063	2,953	.....	.....
August	21,389	1,118	.....	.....	48,501	2,069	.....	.....	27,085	5,468	.....	.....
September	38,657	2,193	.....	.....	75,612	3,858	.....	.....	81,779	14,223	.....	.....
October	222,365	9,421	.....	.....	128,618	5,147	.....	.....	59,498	9,213	.....	.....
November	174,494	6,435	.....	.....	94,982	3,173	.....	.....	25,608	6,630	.....	.....
December	39,125	1,644	.....	.....	64,337	3,544	.....	.....	2,053	473	.....	.....
Total	1,468,089	47,912	.....	.....	878,319	37,451	.....	.....	311,454	55,878	.....	.....
Grand total	26,507,362	959,993	53,258	2,092	2,644,320	102,438	13,940	593	1,770,073	301,040	10,931	1,240
Grounds E. of 66° W. long	1,235,477	45,218	53,258	2,092	714,975	24,102	13,940	593	1,093,359	176,595	10,931	1,240
Grounds W. of 66° W. long	25,271,885	914,775	.....	.....	1,929,345	78,336	.....	.....	676,714	124,445	.....	.....
Landed at Boston in 1917	4,008,279	178,544	.....	.....	2,052,048	71,416	.....	.....	490,478	80,041	.....	.....
Landed at Gloucester in 1917	9,137,659	354,119	39,870	1,204	577,148	12,821	20,405	608	907,770	96,373	42,364	3,604
Landed at Portland in 1917	1,321,572	45,389	412	12	896,202	34,198	3,500	71	325,452	39,214	.....	.....

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN AND CANADIAN FISHING VESSELS DURING THE YEAR 1918, SHOWN BY MONTHS—Continued.

Months.	Mackerel.											
	Large (over 2¼ pounds).				Medium (1½ to 2¼ pounds).				Small (under 1½ pounds).			
	Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.	
LANDED AT BOSTON.	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
January												
February												
March												
April												
May	216,913	$31,343										
June	2,054,582	199,711	66,000	$6,930	4,485	$135						
July	2,204,151	230,072	108,400	17,058	137,450	13,636						
August	371,130	61,219			5,000	750			141,637	$13,005		
September	124,375	22,077			716,235	88,539	30,220	$4,479	166,790	18,282	9,400	$1,504
October	5,910	1,222			269,057	45,713						
November	18,765	4,097			97,569	17,376						
December					31,564	5,360						
Total	4,995,826	549,741	174,400	23,988	1,261,360	171,509	30,220	4,479	308,427	31,287	9,400	1,504
LANDED AT GLOUCESTER.												
January												
February												
March												
April												
May	8,347	755	400	30								
June	43,230	4,435	1,260,563	134,733								
July	8,600	1,290	35,200	5,538	5,251	420	785,310	121,003				
August			69,395	13,433	238,450	12,150	26,400	3,179	200	27	200	27
September			9,000	1,565			99,465	16,761			25,700	3,881
October	23,169	4,292					1,000	176				
November	15,626	2,719										
December												
Total	98,972	13,491	1,374,558	155,299	243,701	12,570	912,175	141,119	200	27	25,900	3,908

LANDED AT PORTLAND.												
January												
February												
March												
April												
May												
June	203,742	15,429	48,200	4,820	1,518	219						
July	4,704	764			13,092	2,426			2,918	284		
August	88,324	11,014	1,200	168	61,765	7,419			66,815	7,093		
September	140,945	21,228			29,866	4,281			50,545	3,702		
October	1,748	277							3,666	279		
November	4,280	599										
December												
Total	443,743	49,311	49,400	4,988	106,241	14,345			123,944	11,358		
Grand total	5,538,541	612,543	1,598,358	184,275	1,611,302	198,424	942,395	145,598	432,571	42,672	35,300	5,412
Grounds E. of 66° W. long	1,611,121	144,909	1,374,763	146,483	4,485	135						
Grounds W. of 66° W. long	3,927,420	467,634	223,595	37,792	1,606,817	198,289	942,395	145,598	432,571	42,672	35,300	5,412
Landed at Boston in 1917	5,839,801	435,325	219,900	15,205	2,574,546	211,151	3,600	270	933,099	73,246	272,010	28,397
Landed at Gloucester in 1917	227,425	13,910	1,301,700	156,646	517,586	27,800	1,768,954	174,470	1,331,930	64,552	1,844,082	211,574
Landed at Portland in 1917	450,840	34,167			101,885	7,442			54,705	1,964		

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN AND CANADIAN FISHING VESSELS DURING THE YEAR 1918, SHOWN BY MONTHS—Continued.

Months.	Miscellaneous. [a]				Total.				Grand total.	
	Fresh.		Salted.		Fresh.		Salted.			
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
LANDED AT BOSTON.										
January	75,986	$3,682			5,085,040	$377,606			5,085,040	$377,606
February	121,787	8,187			8,609,850	618,346			8,609,850	618,346
March	383,220	14,565			10,294,520	604,024			10,294,520	604,024
April	381,079	16,889			9,495,486	393,375	35,000	$1,400	9,530,486	394,775
May	874,539	27,944			9,487,194	421,359			9,487,194	421,359
June	478,222	16,719			8,660,872	555,143	66,000	6,930	8,726,872	562,073
July	795,893	97,445			11,494,346	764,288	108,400	17,058	11,602,746	781,346
August	923,779	132,500			10,144,665	669,047			10,144,665	669,047
September	306,342	26,871			11,491,694	693,163	39,620	5,983	11,531,314	699,146
October	449,155	25,941			9,195,838	523,409			9,195,838	523,409
November	324,159	17,829			8,620,246	468,406			8,620,246	468,406
December	371,213	15,957			6,647,270	468,217			6,647,270	468,217
Total	5,485,374	404,529			109,227,021	6,556,383	249,020	31,371	109,476,041	6,587,754
LANDED AT GLOUCESTER.										
January	106,638	7,998	3,131,800	$166,684	505,983	44,245	3,131,800	166,684	3,637,783	210,929
February	142,045	8,518	1,649,238	79,181	429,258	29,814	1,649,238	79,181	2,078,496	108,995
March	64,115	2,444	569,776	28,577	2,683,173	126,429	569,776	28,577	3,252,949	155,006
April					7,432,946	292,917	28,200	1,596	7,461,146	294,513
May	1,578,546	19,806			10,191,144	310,453	51,785	2,999	10,242,929	313,452
June	364,389	4,386			7,098,801	244,294	2,621,642	219,537	9,720,443	463,831
July	6,600	83	7,600	164	6,501,393	230,566	1,789,573	184,540	8,290,966	415,106
August					5,093,455	166,350	401,181	36,526	5,494,636	202,876
September					2,124,244	77,561	721,135	68,003	2,845,379	145,564
October					6,368,119	213,203	258,257	24,623	6,626,376	237,826
November	6,500	910			8,395,226	271,966	76,224	7,085	8,471,450	279,051
December	31,871	1,257	874,210	46,923	5,178,736	188,533	874,210	46,923	6,052,946	235,456
Total	2,300,704	45,402	6,232,624	321,529	62,002,478	2,196,331	12,173,021	866,274	74,175,499	3,062,605
LANDED AT PORTLAND.										
January	55,911	1,735			362,837	34,099			362,837	34,099
February	64,692	2,110			549,328	43,672			549,328	43,672
March	56,461	1,473			692,579	38,720	2,940	185	695,519	38,905

April	20,738	601	.....	.....	1,759,316	64,319	.....	.....	1,759,316	64,319
May	2,332,066	39,312	.....	.....	4,499,315	112,567	.....	.....	4,499,315	112,567
June	3,135,678	44,107	.....	.....	5,837,704	142,759	48,200	4,820	5,885,904	147,579
July	657,624	10,541	.....	.....	2,386,495	83,797	.....	.....	2,386,495	83,797
August	40,399	4,611	.....	.....	1,511,342	86,099	1,200	168	1,512,542	86,267
September	36,773	3,002	.....	.....	972,634	84,580	2,732	217	975,366	84,797
October	59,649	3,305	.....	.....	1,470,691	76,807	.....	.....	1,470,691	76,807
November	43,136	1,914	.....	.....	986,601	53,818	.....	.....	986,601	53,818
December	44,176	1,491	.....	.....	765,699	54,562	.....	.....	765,699	54,562
Total	6,547,303	114,202	.....	.....	21,794,541	875,799	55,072	5,390	21,849,613	881,189
Grand total	14,333,381	564,133	6,232,624	321,529	193,024,040	9,628,513	12,477,113	903,035	205,501,153	10,531,548
Grounds E. of 66° W. long	451,148	34,565	6,225,024	321,365	53,872,923	2,341,270	11,247,593	712,617	65,120,516	3,053,887
Grounds W. of 66° W. long	13,882,233	529,568	7,600	164	139,151,117	7,287,243	1,229,520	190,418	140,380,637	7,477,661
Landed at Boston in 1917	6,615,341	425,826	.....	.....	98,154,629	6,122,568	495,510	43,872	98,650,139	5,166,440
Landed at Gloucester in 1917	3,404,964	50,268	6,321,810	212,317	40,062,098	1,366,350	18,072,846	1,085,134	58,134,944	2,451,484
Landed at Portland in 1917	3,907,240	72,267	.....	.....	18,566,377	739,278	79,126	4,130	18,645,503	743,408

a Includes herring from Newfoundland, 161,800 pounds frozen, value $10,508, and 6,225,024 pounds, salted, value $321,365.

The fishery products landed at Boston and Gloucester, Mass., and Portland, Me., by fishing vessels each year are taken principally from fishing grounds lying off the coast of the United States. In the calendar year 1918, 68.10 per cent of the quantity and 70.86 per cent of the value of the catch landed at these ports by American and Canadian fishing vessels were taken from these grounds; 4.36 per cent of the quantity and 4.70 per cent of the value, consisting chiefly of herring, were taken from fishing banks off the coast of Newfoundland; and 27.52 of the quantity and 24.43 per cent of the value from fishing grounds off the Canadian Provinces. Newfoundland herring constituted 3.10 per cent of the quantity and 3.15 per cent of the value of the fishery products landed at these ports during the year. The herring were taken on the treaty coast of Newfoundland, and the cod and other species from that region were obtained from fishing banks on the high seas. All fish caught by American fishing vessels off the Canadian Provinces were from offshore fishing grounds. The catch from each of these regions is given in detail in the following table:

QUANTITY AND VALUE OF FISH LANDED BY AMERICAN AND CANADIAN FISHING VESSELS AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., IN 1918, FROM GROUNDS OFF THE COAST OF THE UNITED STATES, NEWFOUNDLAND, AND CANADIAN PROVINCES.

Species.	United States.		Newfoundland.		Canadian Provinces.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Cod:								
Fresh	38,747,186	$2,186,911	1,131,625	$39,770	28,458,768	$1,153,172	68,337,579	$3,379,853
Salted	20,525	1,448	627,863	50,149	2,838,460	185,755	3,486,848	237,352
Haddock:								
Fresh	47,975,763	2,492,810	334,245	10,967	18,293,041	691,998	66,603,049	3,195,775
Salted	.....	.....	11,614	786	56,878	2,715	68,492	3,501
Hake:								
Fresh	4,434,193	242,142	54,145	2,012	757,524	27,488	5,245,862	271,642
Salted	105	4	8,300	404	26,562	1,035	34,967	1,443
Pollock:								
Fresh	25,262,430	914,511	23,050	636	1,221,882	44,846	26,507,362	959,993
Salted	.....	.....	245	11	53,013	2,081	53,258	2,092
Cusk:								
Fresh	1,796,853	74,343	3,095	96	844,372	27,999	2,644,320	102,438
Salted	.....	.....	435	20	13,505	573	13,940	593
Halibut:								
Fresh	675,692	124,194	388,507	57,949	705,874	118,897	1,770,073	301,040
Salted	.....	.....	2,905	347	8,026	893	10,931	1,240
Mackerel:								
Fresh	5,966,808	708,595	.....	.....	1,615,606	145,044	7,582,414	853,639
Salted	1,201,290	188,802	.....	.....	1,374,763	146,483	2,576,053	335,285
Herring:								
Fresh	8,602,538	128,645	161,800	10,508	.....	.....	8,764,338	139,153
Salted	7,600	164	6,225,024	321,365	.....	.....	6,232,624	321,529
Swordfish: Fresh	974,864	209,095	180	47	59,047	14,050	1,034,091	223,192
Tilefish: Fresh	299,420	20,246	.....	.....	.....	.....	299,420	20,246
Miscellaneous: Fresh	4,002,011	171,395	.....	.....	233,521	10,147	4,235,532	181,542
Total	139,967,278	7,463,305	8,973,033	495,067	56,560,842	2,573,176	205,501,153	10,531,548

Cod.—In 1918 the fishing fleet landing fish at Boston, Gloucester, and Portland was considerably larger than in the previous year. There were 5 vessels in the salt bank fishery and 123 in the market fishery landing their fares of cod and other ground fish at these ports. Large quantities of cod were also landed by vessels fishing on the shore grounds. The total catch of cod landed at these ports during the year amounted to 71,824,427 pounds, valued at $3,617,205, of which 68,337,579 pounds, valued at $3,379,853, were fresh, and 3,486,848 pounds, valued at $237,352, were salted. Cod ranked first in importance both in quantity and value among the various species landed.

Haddock.—The catch of haddock for the year ranked second to that of cod, the total catch amounting to 66,671,541 pounds, valued at $3,199,276, all of which was landed fresh except 68,492 pounds, valued at $3,501. The greater part of the catch was taken on Georges Bank and in South Channel.

Hake.—The yield of hake has fallen off very much in the past few years. In 1918 the catch amounted to 5,280,829 pounds, valued at $273,085, all landed fresh except 34,967 pounds, salted, valued at $1,443. There was a decline of 2,633,817 pounds, or over 33 per cent, in quantity, and $68,300, or 20 per cent, in value as compared with the previous year. In 1916 over 13,000,000 pounds of hake were landed at these ports, and in 1910 the receipts at Boston and Gloucester were nearly 20,000,000 pounds.

Pollock.—The pollock catch was much larger than usual, the quantity landed amounting to 26,560,620 pounds, valued at $962,085, all landed fresh except 53,258 pounds, salted, valued at $2,092.

Cusk.—The quantity of cusk landed was small as compared with recent previous years, amounting to only 2,658,260 pounds, valued at $103,031, of which 13,940 pounds, valued at $593, were salted. The catch of this species is usually from upwards of three million to upwards of six million pounds.

Halibut.—The yield of halibut was 1,781,004 pounds, valued at $302,280, which was all landed fresh except 10,931 pounds, salted, valued at $1,240. There was an increase in quantity over the previous year of less than 1 per cent, but an increase in value of 37.88 per cent.

Mackerel.—The total catch of fresh mackerel taken by the American fishing fleet in 1918 was 69,314 barrels, compared with 111,932 barrels the previous year, a decrease of 42,618 barrels. The output of salted mackerel was 13,030 barrels, as compared with 32,162 barrels the previous year, a decrease of 19,132 barrels. The quantity of mackerel landed at Boston, Gloucester, and Portland by the fishing fleet during the year was 10,158,467 pounds, valued at $1,188,924, of which 7,582,414 pounds, valued at $853,639, were fresh, and 2,576,053 pounds, valued at $335,285, were salted. This quantity includes 29,152 pounds of fresh mackerel, valued at $2,423, from the Cape Shore, landed by Canadian vessels.

The southern mackerel fleet numbered about 35 sail of seiners and 125 sail of netters. The seiners had a light catch, and reported considerable quantities of mackerel, but that they were wild, chasing live feed, and therefore hard to catch. They did not school much at night, but mostly during the day. The first seiner arrived at New York on May 6 with 13,000 large and medium mackerel, which were sold at 18 to 20 cents per pound. These fish were taken in 34 fathoms of water. The netters did not land as many mackerel as the previous year, but, owing to the higher prices received, they did well financially. The mackerel landed by the southern fleet this year were all large and medium fish and sold at 13 to 20 cents per pound, according to market conditions.

The Cape Shore fleet numbered 38 vessels, being a little larger than the previous year. No vessel made more than one trip. A large body of fish was reported and all the vessels returned with good catches. The catch taken on the Cape Shore amounted to 1,689,000 pounds of fresh mackerel and 7,558 barrels salted, compared with 2,229,900 pounds fresh and 7,131 barrels salted the previous year.

The first arrival from the Cape Shore was on June 8, and consisted of 50,000 large and medium fresh mackerel, which sold at 10½ cents per pound. One schooner, on her Cape Shore mackerel trip, obtained 95,000 pounds fresh and 375 barrels of salted mackerel, and stocked $15,665, the crew sharing $343 each. This is said to be the largest stock ever made on a single mackerel trip.

Swordfish.—The quantity of swordfish landed during the year was 1,034,091 pounds, valued at $223,192. The number of vessels engaged in this fishery was 37, or 5 less than in the previous year.

Flounders.—The catch of flounders in the vessel fisheries amounted to 2,269,807 pounds, valued at $93,800. There was an increase in the catch of flounders over the previous year of 990,086 pounds, or 77.36 per cent, in quantity, and $48,864, or 108.74 per cent, in value. The catch taken by boats under 5 tons net tonnage is not included in these statistics.

VESSEL FISHERIES AT SEATTLE, WASH.

In the vessel fisheries at Seattle, Wash., there has been an increase in both the quantity and value of products landed by the fishing fleet, but a decrease in the products landed by collecting vessels as compared with the previous year. Statistics of the vessel fisheries at Seattle have been collected by the local agent and published as monthly and annual statistical bulletins, giving the quantity and value of fishery products landed by American fishing and collecting vessels at that port.

In 1918 the fishing fleet at Seattle landed 834 trips, aggregating 17,091,695 pounds of fish, having a value to the fishermen of $1,887,653. This catch was taken from the fishing grounds along the coast from the Oregon and Washington coasts to Portlock Bank, Alaska. The largest quantities were taken from Grays Harbor Grounds, Flattery Banks, west coast of Vancouver Island, Hecate Strait, and Portlock Bank. The products included halibut, 10,244,200 pounds, valued at $1,528,846; cod, 85,300 pounds, valued at $2,202; sablefish, 4,354,950 pounds, valued at $271,167; "lingcod," 1,784,600 pounds, valued at $62,292; rockfishes, 620,770 pounds, valued at $22,899; and sturgeon, 1,875 pounds, valued at $247. Compared with the previous year, there was an increase of 214 trips by fishing vessels, and of 437,751 pounds, or 2.64 per cent, in the quantity, and $148,851, or 8.56 per cent, in the value of the products landed. The catch of salmon by these vessels was not so large as in the previous year, but there was a large increase in the catch of sablefish, "lingcod", and rockfishes.

The fishery products taken in Puget Sound and landed at Seattle by collecting vessels during the year amounted to 10,605,323 pounds, valued at $912,598. These products included salmon, 8,929,745 pounds, valued at $811,028; steelhead trout, 433,756 pounds, valued at $57,724; herring, 580,200 pounds, valued at $11,853; smelt, 121,850 pounds, valued at $7,019; sole, 138,935 pounds, valued at $5,307; crabs, 139,821 pounds, valued at $10,368; and other species amounting to 261,016 pounds, valued at $9,299. In the products landed by collecting vessels there was a decrease from the previous year of 2,216,030 pounds, or 17.28 per cent, in quantity, and $75,961, or 7.68 per cent, in value. The quantity and value of fishing products landed at Seattle by fishing and collecting vessels in 1918 are given in detail in the following table:

Quantities and Values of Certain Fresh Fishery Products Landed at Seattle, Wash., by American Fishing Vessels During the Calendar Year 1918.

BY FISHING GROUNDS.

	Number of trips.	Halibut.		Cod.		Sablefish.		"Lingcod."		Rockfishes.		Sturgeon.		Total.	
		Pounds.	*Value.*	*Pounds*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Oregon and Washington coasts	24	519,500	$76,138			231,000	$14,685	135,500	$4,450	21,000	$965			907,000	$96,238
Columbia River grounds	11	218,500	34,394			266,000	17,365	43,000	1,925	8,000	610			535,500	54,294
Grays Harbor grounds	31	298,400	44,789			713,000	47,811	42,000	1,295	17,000	525			1,070,400	94,420
Flattery Banks	480	3,038,950	460,646			1,903,200	114,872	1,184,000	40,613	286,000	10,432	475	$72	6,412,625	626,635
West coast Vancouver Island	133	1,223,150	190,400			710,400	42,383	318,100	11,699	135,900	5,257	800	80	2,388,350	249,819
Queen Charlotte Islands grounds	3	97,000	19,560			14,000	840	6,000	240					117,000	20,640
Hecate Strait	113	2,573,800	372,388			416,800	27,167	53,500	1,985	142,000	4,690	600	95	3,186,700	406,325
Forrester Island grounds	2	32,000	5,860			4,000	240							36,000	6,100
Coronation Island	2	85,000	12,378			15,000	1,110							100,000	13,488
Yakutat grounds	15	820,300	125,811	51,000	$1,380	51,150	2,989			9,100	367			931,550	130,547
Cape Cleare grounds	3	213,000	33,240			14,200	917							227,200	34,157
Portlock Bank	17	1,124,600	153,242	34,300	822	16,200	788	2,500	85	1,770	53			1,179,370	154,990
Total	834	10,244,200	1,528,846	85,300	2,202	4,354,950	271,167	1,784,600	62,292	620,770	22,899	1,875	247	17,091,695	1,887,653

BY MONTHS.

January	9	233,200	$43,549	5,100	$204	53,350	$2,514	5,000	$200	5,000	$200			301,650	$46,667
February	18	327,000	60,925			53,500	3,048	40,200	1,608	8,100	327			428,800	65,908
March	41	417,300	62,093	15,000	300	85,600	5,445	76,300	3,981	52,500	2,762			646,700	74,581
April	113	959,300	139,789	25,200	498	139,800	9,340	417,500	15,095	107,870	4,939	1,075	$167	1,650,745	169,828
May	131	1,553,300	220,424			359,200	23,421	651,000	19,635	105,800	3,191	800	80	2,670,100	266,751
June	110	1,339,000	198,794			542,200	38,021	195,600	6,813	83,500	2,628			2,160,300	246,256
July	90	1,429,550	198,140			733,000	49,592	92,000	3,170	71,500	2,435			2,326,050	253,337
August	103	1,352,650	181,949			974,800	62,565	63,500	1,725	44,000	1,280			2,434,950	247,519
September	103	1,565,800	230,708	36,000	1,080	875,600	48,645	104,000	3,725	67,500	2,047			2,648,900	286,205
October	70	710,700	120,610	4,000	120	417,000	21,640	46,000	1,510	33,000	970			1,210,700	144,850
November	33	240,900	48,700			98,800	5,310	44,000	1,570	21,000	650			404,700	56,230
December	13	115,500	23,165			22,100	1,626	49,500	3,260	21,000	1,470			208,100	29,521
Total	834	10,244,200	1,528,846	85,300	2,202	4,354,950	271,167	1,784,600	62,292	620,770	22,899	1,875	247	17,091,695	1,887,653

FISHERY PRODUCTS, BY MONTHS, TAKEN IN PUGET SOUND AND LANDED AT SEATTLE, WASH., BY COLLECTING VESSELS DURING THE YEAR 1918.

Species.	January.		February.		March.		April.		May.		June.		July.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Skates									1,700	$85	830	$27	370	$14
Sturgeon					324,200	$4,863			46,000	690				
Herring														
Salmon:														
Humpback or pink													1,200	72
Chum or keta	10,000	$1,100											4,280	340
King or spring	5,000	700					10,490	$1,560	500,600	62,000	413,500	53,755	1,983,200	198,320
Coho or silver											34,800	3,480	10,328	1,032
Sockeye or red									2,200	275	9,220	1,198	12,880	1,288
Miscellaneous							25,750	3,962	55,410	6,926	25,800	2,580	5,100	510
Trout: Steelhead	8,000	1,200	16,100	$2,445	3,000	450	14,376	2,300	215,000	26,775	7,430	817	14,640	1,464
Smelt			2,300	115							790	94		
Perch			700	35					10,600	530				
Rockfishes			1,000	70			3,240	260			1,720	41	1,200	84
"Lingcod"	2,000	120					600	30			6,830	273		
Sablefish											3,700	142		
Cod	2,000	60	40,000	1,400										
Flounders			4,000	120	4,300	86	3,500	85	13,550	405	7,840	196	3,600	108
Sole	5,000	200	13,855	554	15,500	620	9,500	380	24,050	960	4,000	140	860	34
Other fish	20,000	400												
Octopus													560	11
Crabs	16,368	981	7,238	403	13,530	2,029	9,680	804	14,080	970	2,684	183		
Total	68,368	4,761	85,193	5,142	360,530	8,048	77,136	9,381	883,190	99,616	519,144	62,926	2,038,218	203,277

Species.	August.		September.		October.		November.		December.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Skates	7,970	$159	21,500	$645	8,270	$168	5,000	$150	.....	.....	42,740	$1,122
Sturgeon	1,080	108	870	87	1,680	201	460	34	.....	.....	6,990	556
Herring	.....	.....	.....	.....	.....	.....	.....	.....	210,000	$6,300	580,200	11,853
Salmon:												
Humpback or pink	11,210	660	.....	.....	.....	.....	.....	.....	.....	.....	12,410	732
Chum or keta	66,900	2,155	336,000	10,080	1,768,960	88,448	331,820	33,180	360,000	43,200	2,877,960	178,503
King or spring	614,220	61,420	641,800	64,480	52,837	5,280	20,460	2,046	.....	.....	4,245,107	449,561
Coho or silver	160,680	16,068	588,950	58,950	800,930	80,009	35,800	3,580	.....	.....	1,631,488	163,119
Sockeye or red	6,220	622	8,000	30	.....	.....	.....	.....	.....	.....	38,520	3,413
Miscellaneous	2,200	222	.....	.....	.....	.....	.....	.....	10,000	1,500	124,260	15,700
Trout: Steelhead	1,860	186	2,080	20	7,810	781	2,660	266	140,800	21,020	433,756	57,724
Smelt	14,230	852	34,080	1,704	14,180	850	26,070	1,280	30,200	2,124	121,850	7,019
Perch	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	11,300	565
Rockfishes	9,816	352	4,800	240	6,300	431	1,600	112	6,800	476	36,476	2,066
"Lingcod"	.....	.....	.....	.....	9,280	278	.....	.....	.....	.....	18,710	701
Sablefish	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3,700	142
Cod	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	42,000	1,460
Flounders	9,680	288	10,600	318	7,870	236	2,600	104	11,000	330	78,540	2,276
Sole	9,800	294	18,000	630	19,000	720	5,120	205	14,250	570	138,935	5,307
Other fish	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	20,000	400
Octopus	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	560	11
Crabs	.....	.....	.....	.....	20,691	1,312	.....	.....	55,550	3,686	[a] 139,821	10,368
Total	915,866	83,386	1,669,680	137,184	2,717,808	178,714	431,590	40,957	838,600	79,206	10,605,323	912,598

[a] 6,294 dozen.

FISHERIES OF THE GREAT LAKES, LAKE OF THE WOODS, AND RAINY LAKE IN 1917.

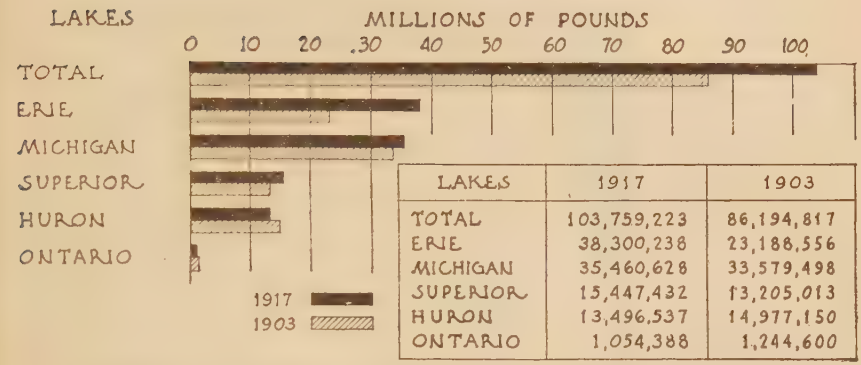
A statistical canvass of the fisheries of the Great Lakes, including Lake of the Woods, Rainy Lake, and Lakes Kabetogama and La Croix, was made during the year for the calendar year 1917.

The number of persons engaged in the fisheries of these waters in 1917 was 9,416; the investment was $10,732,879; and the products amounted to 105,926,392 pounds, valued at $6,416,477.

In the fisheries of the Great Lakes the number of persons engaged was 9,221; the investment in vessels, boats, fishing apparatus, shore and accessory property, and cash capital was $10,555,669; and the products amounted to 103,759,223 pounds; valued at $6,297,969. The principal species taken, including fresh, salted, and smoked fish, were carp, 7,163,347 pounds, valued at $334,888; ciscoes, 53,429,325 pounds, valued at $2,609,917; blue pike, 2,102,803 pounds, valued at $140,025; wall-eyed pike, 2,496,691 pounds, valued at $298,271; sauger, 3,929,172 pounds, valued at $240,035; sheepshead or drum, 2,901,994 pounds, valued at $70,936; suckers, 5,361,138 pounds, valued at $204,825; lake trout, 13,344,139 pounds, valued at $1,286,704; whitefish, 6,190,748 pounds, valued at $723,167; and yellow perch, 4,206,011 pounds, valued at $245,223. The ciscoes include lake herring, chub, longjaw, bluefin or blackfin, and tullibee.

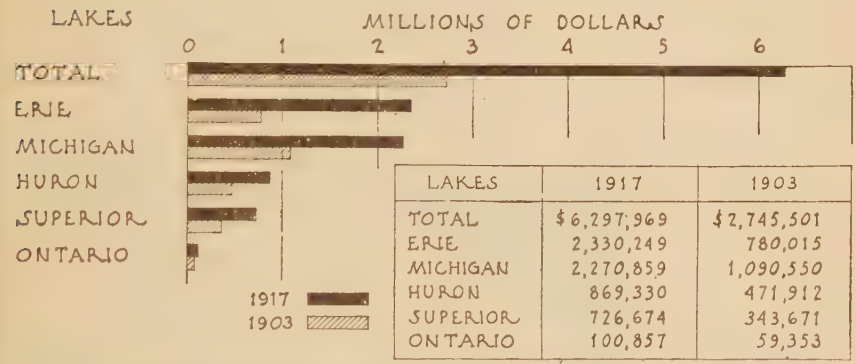
Compared with the returns for 1908, published by the Bureau of the Census, there was an increase of 8.06 per cent in the number of persons engaged, and of 119.27 per cent in the amount of capital invested, but there was a decrease of 2.69 per cent in the quantity, with an increase of 67.14 per cent in the value of the products. There was a large increase in the catch of burbot, cisco or lake herring, sheepshead or drum, and lake trout, but a decrease in carp, pike, pike perch, whitefish, and a number of other species. Compared with the statistics for 1903, published by the Bureau, there was a decrease of 1.20 per cent in the number of persons engaged, but an increase of 41.22 per cent in the amount of capital invested, and of 20.37 per cent in the quantity, and 129.39 per cent in the value of the products. There was considerable increase in nearly all of the more important species except pike perch, lake trout, and yellow perch. The increase in burbot, and possibly some of the other species, is, no doubt, due to the work of the Bureau in encouraging the more extensive use as food of species heretofore little used for that purpose.

In the fisheries of Lake of the Woods and Rainy Lake the number of persons engaged was 195; the investment was $177,210; and the products amounted to 2,167,169 pounds, valued at $118,508. The principal species taken were ciscoes, pike, wall-eyed pike, suckers, and whitefish.



LAKES	1917	1903
TOTAL	103,759,223	86,194,817
ERIE	38,300,238	23,188,556
MICHIGAN	35,460,628	33,579,498
SUPERIOR	15,447,432	13,205,013
HURON	13,496,537	14,977,150
ONTARIO	1,054,388	1,244,600

FIG. 3.—Quantities of fish taken in the commercial fisheries of the Great Lakes in 1917 and 1903.



LAKES	1917	1903
TOTAL	$6,297,969	$2,745,501
ERIE	2,330,249	780,015
MICHIGAN	2,270,859	1,090,550
HURON	869,330	471,912
SUPERIOR	726,674	343,671
ONTARIO	100,857	59,353

FIG. 4.—Values of fish taken in the commercial fisheries of the Great Lakes in 1917 and 1903.

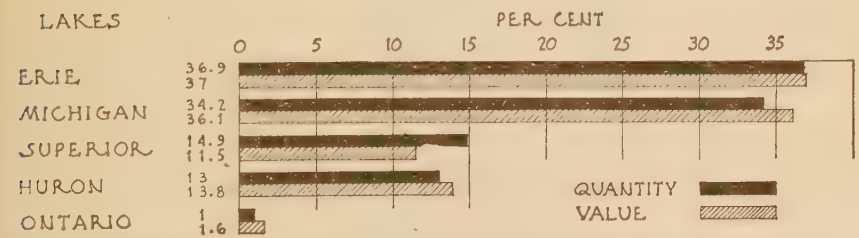
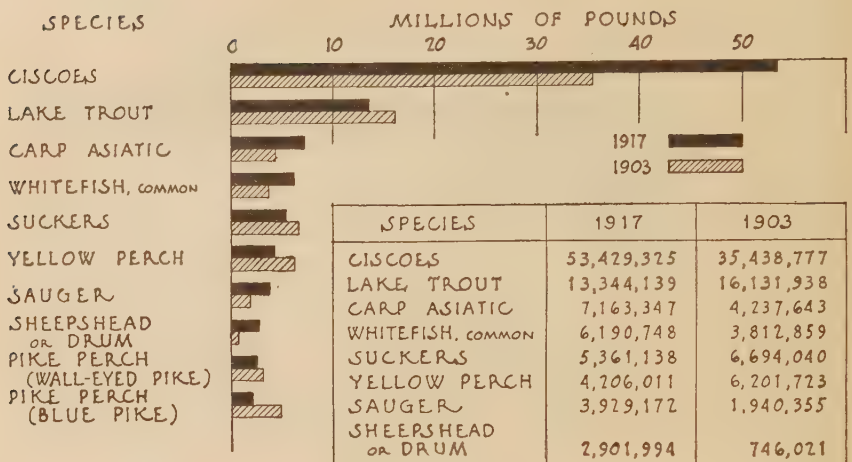
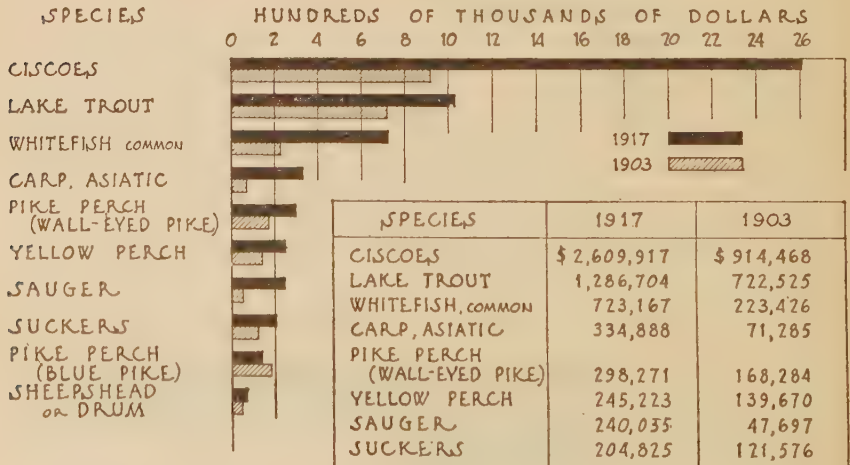


FIG. 5.—Percentages of total quantity and value of fishery products reported for each of the Great Lakes, 1917.



SPECIES	1917	1903
CISCOES	53,429,325	35,438,777
LAKE TROUT	13,344,139	16,131,938
CARP ASIATIC	7,163,347	4,237,643
WHITEFISH, COMMON	6,190,748	3,812,859
SUCKERS	5,361,138	6,694,040
YELLOW PERCH	4,206,011	6,201,723
SAUGER	3,929,172	1,940,355
SHEEPSHEAD OR DRUM	2,901,994	746,021
PIKE PERCH (WALL-EYED PIKE)	2,496,691	3,076,147
PIKE PERCH (BLUE PIKE)	2,102,803	4,981,422

FIG. 6.—Quantities of the more important species of fish taken in the commercial fisheries of the Great Lakes in 1917 and 1903.



SPECIES	1917	1903
CISCOES	$ 2,609,917	$ 914,468
LAKE TROUT	1,286,704	722,525
WHITEFISH, COMMON	723,167	223,426
CARP, ASIATIC	334,888	71,285
PIKE PERCH (WALL-EYED PIKE)	298,271	168,284
YELLOW PERCH	245,223	139,670
SAUGER	240,035	47,697
SUCKERS	204,825	121,576
PIKE PERCH (BLUE PIKE)	140,025	191,386
SHEEPSHEAD OR DRUM	70,936	5,700

FIG. 7.—Values of the more important species of fish taken in the commercial fisheries of the Great Lakes in 1917 and 1903.

Items.	Lake Superior.		Lake Michigan.		Lake Huron.[a]		Lake Erie.[b]		Lake Ontario.[c]		Lake of the Woods and Rainy Lake.[d]		Total.	
	Number.	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*
Persons engaged	1,348		3,313		1,412		2,770		378		195		9,416	
INVESTMENT.														
Vessels fishing, steam	12	$52,800	92	$397,650	13	$57,500	73	$469,398					190	$977,348
Tonnage	302		1,795		266		1,700						4,063	
Outfit		11,080		122,885		22,450		93,679						250,094
Vessels fishing, gasoline	4	20,500	240	234,310	13	19,000	20	39,000	1	$1,200			278	314,010
Tonnage	104		2,113		113		183		8				2,521	
Outfit		5,550		56,636		5,540		7,986		20				75,732
Vessels transporting, steam	4	56,000			2	7,000	5	24,500			2	$9,800	13	97,300
Tonnage	194				24		111				29		358	
Outfit		17,880				500		5,200				6,160		29,740
Vessels transporting, gasoline	7	19,500	60	38,225	19	33,500	19	41,600	1	1,300			106	134,125
Tonnage	68		495		169		193		10				935	
Outfit		3,915		4,515		4,750		9,455		65				22,700
Sail and rowboats	417	10,220	428	9,943	370	9,660	602	27,370	189	4,765	3	800	2,009	62,758
Power boats	280	82,405	311	91,595	264	104,860	414	178,815	79	17,130	79	27,300	1,427	502,105
Pound nets and trap nets	204	26,262	1,134	242,570	1,731	207,904	5,011	681,060	353	21,460	185	36,250	8,618	1,215,506
Gill nets	11,117	144,986	83,807	645,074	10,610	102,835	47,578	329,632	165	15,175	220	8,150	153,497	1,245,852
Fyke nets			2,828	39,795	460	12,135	801	44,403	334	4,374	30	400	4,453	101,107
Seines	5	325	61	18,120	83	9,325	285	38,867	12	610			446	67,247
Lines		5,773		27,868		5,989		741		1,174				41,545
Crawfish pots			6,400	1,600									6,400	1,600
Fishing machines									7	795			7	795
Other apparatus						1,520		10		6				1,536
Shore and accessory property		341,310		1,758,341		444,092		1,884,165		50,235		81,850		4,559,993
Cash capital		42,500		349,800		156,100		456,886		20,000		6,500		1,031,786
Total		841,006		4,038,927		1,204,660		4,332,767		138,309		177,210		10,732,879

[a] Includes Lake St. Clair and St. Clair River.
[b] Includes men and investment in the wholesale fish trade of Detroit.
[c] Includes St. Lawrence and Niagara Rivers.
[d] Includes Lakes Kabetogama and La Croix.

STATISTICS OF FISHERIES OF THE GREAT LAKES, LAKE OF THE WOODS, AND RAINY LAKE IN 1917—Continued.

Items.	Lake Superior.		Lake Michigan.		Lake Huron.		Lake Erie.		Lake Ontario.		Lake of the Woods and Rainy Lake.		Total.	
PRODUCTS.	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Bowfin	2,675	$170	.....	.....	200	$4	5,165	$69	7,046	$350	.....	.....	15,086	$593
Buffalofish	.....	.....	1,290	$56	.....	.....	.....	.....	.....	.....	.....	.....	1,290	56
Burbot	.....	.....	166,785	1,436	2,174	51	652,870	8,027	61,760	2,388	67,740	$564	951,329	12,466
Carp, Asiatic	.....	.....	246,503	7,500	1,230,580	48,126	5,644,792	277,089	41,472	2,173	.....	.....	7,163,347	334,888
Catfish and bullheads	.....	.....	164,466	6,627	33,329	3,295	618,532	39,232	47,934	5,935	9,650	570	873,911	55,659
Ciscoes, fresh	8,994,855	319,858	15,341,588	706,638	3,277,573	120,705	17,160,852	1,046,862	460,363	39,991	392,548	12,770	45,627,779	2,246,824
Ciscoes, salted	3,158,227	139,959	2,917,766	139,344	2,100,792	94,957	.....	.....	8,909	1,051	.....	.....	8,185,694	375,311
Ciscoes, smoked	5,400	432	.....	.....	3,000	120	.....	.....	.....	.....	.....	.....	8,400	552
Eel	.....	.....	.....	.....	.....	.....	.....	.....	43,007	3,402	.....	.....	43,007	3,402
Gold-eye	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	50,365	813	50,365	813
Muskellunge	.....	.....	.....	.....	145	15	.....	.....	.....	.....	.....	.....	145	15
Pike	5,700	555	40,597	3,375	12,354	1,175	5,666	550	16,191	2,149	553,037	22,109	633,545	29,913
Pike perch (blue pike)	.....	.....	.....	.....	.....	.....	2,057,073	135,241	45,730	4,784	.....	.....	2,102,803	140,025
Pike perch (wall-eyed or yellow pike)	27,979	3,774	132,024	18,445	1,042,642	126,431	1,291,456	149,163	2,590	458	706,279	67,615	3,202,970	365,886
Rock bass	.....	.....	1,714	137	4,283	208	100	5	7,525	463	.....	.....	13,622	813
Sauger	.....	.....	.....	.....	.....	.....	3,929,172	240,035	.....	.....	.....	.....	3,929,172	240,035
Sheepshead or drum	.....	.....	28,412	796	17,731	615	2,855,551	69,502	300	23	.....	.....	2,901,994	70,936
Sturgeon	.....	.....	10,805	2,517	4,886	1,063	28,384	6,064	51,141	12,057	13,820	1,659	109,036	23,360
Sturgeon caviar	.....	.....	346	904	227	495	1,018	2,045	544	1,232	.....	.....	2,135	4,676
Suckers, fresh	326,203	13,184	2,103,163	74,803	1,775,767	72,883	1,035,934	36,403	89,111	6,317	268,980	3,584	5,599,158	207,174
Suckers, salted	15,850	560	14,110	625	1,000	50	.....	.....	.....	.....	.....	.....	30,960	1,235
Sunfish	.....	.....	.....	.....	1,650	68	.....	.....	23,885	1,327	.....	.....	25,535	1,395
Trout, lake, fresh	2,581,081	215,397	8,647,895	852,879	2,070,797	213,790	1,922	201	23,694	2,818	2,630	209	13,328,019	1,285,294
Trout, lake, salted	7,272	576	2,820	259	8,658	784	.....	.....	.....	.....	.....	.....	18,750	1,619
Trout, steelhead	.....	.....	21,950	3,349	.....	.....	.....	.....	.....	.....	.....	.....	21,950	3,349
White bass	.....	.....	1,275	77	.....	.....	286,112	17,212	.....	.....	.....	.....	287,387	17,289
Whitefish, common, fresh	302,210	30,943	3,045,448	323,162	993,501	124,050	1,755,947	232,761	88,347	11,720	96,185	8,095	6,281,638	730,731
Whitefish, common, salted	.....	.....	1,945	201	3,350	330	.....	.....	.....	.....	.....	.....	5,295	531
Whitefish, common, caviar	.....	.....	.....	.....	1,375	257	.....	.....	.....	.....	.....	.....	1,375	257
Whitefish, Menominee, fresh	12,080	682	100,332	4,829	46,457	2,191	.....	.....	.....	.....	.....	.....	158,869	7,702
Whitefish, Menominee, salted	2,900	228	26,103	1,973	20,017	1,200	.....	.....	.....	.....	.....	.....	49,020	3,401
Yellow perch, fresh	5,000	356	2,361,071	116,419	844,019	56,464	959,357	69,684	34,839	2,219	5,835	510	4,210,121	245,652
Yellow perch, salted	.....	.....	1,725	81	.....	.....	.....	.....	.....	.....	.....	.....	1,725	81
Other fish	.....	.....	.....	.....	30	3	10,335	104	.....	.....	100	10	10,465	117
Crawfish	.....	.....	80,495	4,427	.....	.....	.....	.....	.....	.....	.....	.....	80,495	4,427
Total	15,447,432	726,674	35,460,628	2,270,859	13,496,537	869,330	38,300,238	2,330,249	1,054,388	100,857	2,167,169	118,508	105,926,392	6,416,477

NOTE.—Ciscoes include lake herring, chub, longjaw, bluefin or blackfin, and tullibee.

YIELD OF THE FISHERIES OF THE GREAT LAKES FOR VARIOUS YEARS FROM 1885 TO 1917.[a]

Years.	Lake Superior.		Lake Michigan.		Lake Huron.		Lake Erie.		Lake Ontario.		Lake St. Clair and St. Clair and Detroit Rivers.[b]		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
1885	8,825,980	$291,523	23,518,148	$878,788	11,457,170	$276,397	51,456,517	$1,109,096	2,398,466	$95,869	2,185,795	$40,193	99,842,076	$2,691,866
1890	6,115,992	220,968	26,434,266	830,465	10,056,381	221,067	64,850,873	1,000,905	3,446,448	124,786	2,994,571	73,577	113,898,531	2,471,768
1893	8,096,927	252,107	30,747,755	828,611	12,064,538	306,381	42,968,325	805,979	928,015	31,510	1,814,311	46,030	96,619,671	2,270,618
1899	5,429,654	150,862	34,499,996	876,743	12,418,327	308,078	58,393,864	1,150,895	2,406,332	100,997	579,067	23,864	113,727,240	2,611,439
1903	13,205,013	343,671	33,579,498	1,090,550	14,455,209	450,318	23,188,556	780,015	1,244,600	59,353	521,941	21,594	86,194,817	2,745,501
1908	10,198,000	342,000	40,019,000	1,554,000	12,932,000	486,000	41,922,000	1,280,000	823,000	74,000	737,000	32,000	106,631,000	3,768,000
1917	15,447,432	726,674	35,460,628	2,270,859	13,363,207	857,478	38,300,238	2,330,249	1,054,388	100,857	133,330	11,852	103,759,223	6,297,969

[a] The statistics for 1908 in this table are from data published by the Bureau of the Census.
[b] The decline in the fisheries of Lake St. Clair and St. Clair and Detroit Rivers is due largely to legal restrictions.

FISHERY PRODUCTS RECEIVED AT THE MUNICIPAL FISH WHARF AND MARKET, WASHINGTON. D. C.

Large quantities of fishery products are received at the Municipal Fish Wharf and Market, Washington, D. C., from the Chesapeake region and other sections of the Atlantic coast. The salmon and part of the halibut handled are from the Pacific coast. The products are disposed of to the retail markets of the city, and are also to some extent sold at retail at the municipal market. Through the courtesy of the health department of the District of Columbia the Bureau has been furnished with daily reports of the quantity of fishery products received at this market since the latter part of March last year. These statistics have been compiled for the period from April to December, 1918, and are given in detail, by months, in the following table:

FISHERY PRODUCTS RECEIVED AT THE MUNICIPAL FISH WHARF AND MARKET, WASHINGTON, D. C., FROM APRIL TO DECEMBER, 1918.

Species.	April.	May.	June.	July.	August.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Bass, black and sea	.....	11,800	25,040	3,317	1,208
Bluefish	.....	426	.....	.....	100
Butterfish	523	32,360	69,525	77,609	58,576
Carp	15,957	11,956	5,192	3,450	2,746
Catfish	20,877	16,545	16,158	3,339	6,095
Cod	2,025	750	1,000	8,825	20,620
Croaker	386,660	248,340	197,746	83,641	40,238
Drum, red	100	.....	361	98	.....
Eel	2,427	2,102	694	573	123
Flounders	5,177	8,109	5,442	11,199	12,240
Gizzard shad	670	400	.....	.....	.....
Haddock	.....	.....	400	23,625	34,070
Hake	.....	.....	.....	450	2,250
Halibut	2,725	1,500	2,155	2,555	4,250
Herring:					
River, fresh	418,596	93,867	821	.....	2,250
River, salted	5,000	169,000	27,250	2,500	.....
Hickory shad or jacks	1,340	.....	.....	.....	.....
Hogfish	.....	2,100	200	.....	200
Kingfish	100	200	.....	100	.....
Mackerel	.....	2,625	9,760	10,700	2,850
Menhaden	1,130	.....	.....	200	.....
Mullet	115	20	.....	13	.....
Perch	32,459	12,089	7,349	13,023	1,830
Pike or pickerel	55	20	.....	.....	25
Pollock	300	.....	400	9,150	9,700
Porgy or scup	.....	400	6,000	2,550	825
Salmon	.....	.....	210	675	.....
Shad	307,538	153,090	708	.....	.....
Spot	.....	150	1,126	11,455	12,300
Striped bass	38,822	14,717	5,360	12,166	12,883
Sturgeon	586	1,376	455	90	80
Tilefish	2,525	2,500	735	.....	.....
Trouts, sea	5,131	434,268	227,000	122,237	295,271
Whiting	.....	.....	.....	14,050	2,000
Clams, hard	7,712	14,624	14,720	13,824	13,568
Oysters:					
In the shell	49,861	9,240	3,486	2,002	1,470
Opened	28,364	3,061	.....	.....	487
Squid	.....	1,200	.....	.....	.....
Crabs	585	12,915	40,680	63,930	49,665
Crab meat	1,430	5,540	7,515	7,715	7,320
Turtles	.....	1,685	225	.....	260
Total	1,338,790	1,268,975	677,713	505,061	595,500

FISHERY PRODUCTS RECEIVED AT THE MUNICIPAL FISH WHARF AND MARKET, WASHINGTON, D. C., FROM APRIL TO DECEMBER, 1918—Continued.

Species.	September.	October.	November.	December.	Total.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Bass, black and sea	524	13,782	30,334	25,597	111,602
Bluefish	9,912	18,182	1,050	.....	29,670
Butterfish	15,333	17,709	22,200	800	294,635
Carp	5,821	10,264	6,078	10,100	71,564
Catfish	12,328	22,209	20,582	12,745	130,878
Cisco	.....	.....	225	600	825
Cod	23,320	16,225	16,075	5,640	94,480
Croaker	23,707	19,010	17,460	679	1,017,481
Drum, red	240	.....	.....	.....	799
Eel	689	1,633	1,947	1,116	11,304
Flounders	14,267	16,446	9,310	10,372	92,562
Gizzard shad	1,043	5,423	9,576	9,119	26,231
Haddock	69,100	72,950	41,750	21,205	263,100
Hake	2,775	8,600	27,900	4,200	46,175
Halibut	4,375	11,813	48,935	850	79,158
Herring:					
River, fresh	3,650	.....	.....	300	519,484
River, salted	.....	.....	.....	.....	203,750
Sea	.....	26,850	206,800	2,600	236,250
Hickory shad or jacks	.....	.....	.....	.....	1,340
Hogfish	200	600	920	.....	4,220
Kingfish	100	.....	110	375	985
Mackerel	14,090	13,600	25,850	60,550	140,025
Menhaden	.....	300	.....	.....	1,630
Mullet	502	5,676	5,718	2,360	14,404
Perch	5,544	9,607	12,398	11,820	106,119
Pike or pickerel	720	1,552	1,911	1,197	5,480
Pollock	20,375	20,900	25,440	19,700	105,965
Porgy or scup	1,400	400	.....	.....	11,575
Salmon	225	4,450	12,375	.....	17,935
Shad	.....	.....	.....	2,972	464,308
Sheepshead	100	252	.....	.....	352
Smelt	.....	.....	75	590	665
Spot	15,276	24,230	6,200	.....	70,737
Striped bass	12,883	38,731	24,128	.....	159,690
Sturgeon	130	685	45	30	3,477
Tilefish	.....	1,275	2,550	2,747	12,332
Trouts, sea	302,120	267,975	49,395	34,230	1,737,627
Whitefish	.....	.....	225	.....	225
Whiting	4,800	19,000	104,870	71,488	216,208
Clams, hard	11,584	6,464	6,528	6,304	[a] 95,328
Oysters:					
In the shell	39,347	140,497	218,386	220,129	[b] 684,418
Opened	35,788	92,400	134,821	125,895	[c] 420,816
Scallops	.....	.....	.....	200	200
Squid	.....	.....	.....	.....	1,200
Crabs	28,020	5,250	75	.....	201,120
Crab meat	5,415	7,445	4,925	3,725	51,030
Shrimp	1,050	1,500	1,050	950	4,550
Terrapin	.....	.....	240	.....	240
Turtles	205	.....	315	155	2,845
Total	686,958	923,885	1,098,772	671,340	7,766,994

[a] 11,916 bushels. [b] 97,774 bushels. [c] 51,008 gallons.

FISHERIES OF THE PACIFIC COAST STATES IN 1915.

The data contained in this report apply to the year 1915, and were collected in 1916 and 1917 and prepared by Winthrop A. Roberts and Rob Leon Greer, agents of this Bureau. A statistical bulletin containing the information in condensed form was issued in October, 1917.

The number of persons employed in the fisheries of the Pacific Coast States in 1915 was 28,997, of whom 4,229 were on vessels fishing, 475 on vessels transporting fishery products, 14,235 in shore fisheries, and 10,058 in canneries and other fishery industries. Wash-

ington had 14,649 persons employed in its fisheries; Oregon, 5,900; and California 8,452.

The amount of capital invested in the fisheries of these States was $24,017,967. In Washington the investment was $14,129,553; in Oregon, $4,064,151; and in California, $5,824,263. The investment included 1,039 fishing and transporting vessels and scows of 5 net tons and upward, valued at $3,559,777 and having a net tonnage of 24,703 tons, and outfits valued at $721,156; 9,402 boats, valued at $2,850,211; fishing apparatus used by vessels and boats to the value of $3,147,785; shore and accessory property valued at $12,201,902; and cash capital amounting to $1,537,136. The forms of fishing apparatus having the greatest value were gill nets, 9,863, valued at $1,309,805, and pound nets, 483, valued at $1,122,803. These were all used in the shore or boat fisheries except 158 gill nets, valued at $4,705, employed in the vessel fisheries. The pound nets were all in Washington except 39, valued at $22,700, in Oregon.

The products of the fisheries amounted to 287,085,344 pounds, having a value to the fishermen of $9,306,448. The output in Washington was 159,053,778 pounds, valued at $5,320,725; in Oregon, 34,692,863 pounds, valued at $1,479,021; and in California, 93,338,703 pounds, valued at $2,506,702. The catch of salmon, including steelhead trout, amounted to 131,932,020 pounds, valued at $4,091,681; albacore, 21,049,190 pounds, valued at $316,103; cod, 10,487,401 pounds, valued at $343,338; and halibut, 40,825,874 pounds, valued at $2,050,709. A considerable number of other species were also taken in large quantities.

Compared with the returns for 1904, there was an increase of 47.50 per cent in the number of persons employed, 87.05 per cent in the amount of capital invested, and 70.27 per cent in the quantity and 39.30 per cent in the value of the products. Compared with the returns for 1908, published by the Bureau of the Census, there was an increase of 81.70 per cent in the number of persons employed, 58.21 per cent in the amount of capital invested, and 62.97 per cent in the quantity and 36.07 per cent in the value of the products.

The following tables contain statistics of the number of persons employed, the amount of capital invested, the quantity and value of the products of the fisheries of the Pacific Coast States in 1915, and comparative statistics of those items for various years; also, statistics of various fishery products prepared and the pack of canned salmon in Washington, Oregon, and California in 1915, comparative statistics of the number of cases of salmon canned in certain years, the yield of the fisheries of the principal rivers in 1915, and comparative statistics of the catch of introduced fishes:

PERSONS ENGAGED, INVESTMENT, AND PRODUCTS OF THE FISHERIES OF THE PACIFIC COAST STATES IN 1915.

	Washington.		Oregon.		California.		Total.	
PERSONS ENGAGED.	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*
On vessels fishing	3,655		23		551		4,229	
On vessels transporting	380		60		35		475	
In shore fisheries	5,481		4,472		4,282		14,235	
On shore, in canneries, etc.	5,129		1,345		3,584		10,058	
Total	14,645		5,900		8,452		28,997	
INVESTMENT.								
Vessels fishing	472	$2,194,660	5	$22,650	73	$354,375	550	$2,571,685
Tonnage	11,363		71		3,198		14,635	
Outfit		578,825		3,285		52,791		634,901
Vessels transporting	110	689,248	30	84,184	20	72,000	190	845,432
Tonnage	2,213		267		330		2,810	
Outfit		68,895		11,850		5,510		86,255
Scows (5 tons and over):	299	142,660					299	142,660
Tonnage	7,258						7,258	
Boats, gasoline	1,567	645,480	1,382	582,485	1,429	1,351,110	4,378	2,579,075
Boats, sail, row, etc.	2,591	96,515	1,264	69,805	1,169	104,816	5,024	271,136
Apparatus, vessel fisheries:								
Seines	374	256,875			7	8,550	[a] 381	265,425
Gill nets	5	450			153	4,255	[b] 158	4,705
Beam trawls	16	1,440					16	1,440
Trammel nets					125	3,075	[c] 125	3,075
Lampara nets					1	400	1	400
Paranzella nets					8	2,900	8	2,900
Hoop nets	85	270					85	270
Pots	220	325			120	280	340	605
Whaling apparatus		2,050						2,050
Lines		46,800		1,005		1,562		49,367
Dredges	10	275					10	275
Apparatus, shore fisheries:								
Seines	200	23,115	75	35,125	147	19,485	[d] 422	77,755
Gill nets	2,878	308,859	3,877	582,740	3,950	413,591	[e] 9,705	1,305,190
Pound nets	444	1,100,103	39	22,700			483	1,122,803
Lampara nets					64	29,100	64	29,100
Trammel nets					2,195	56,325	[f] 2,195	56,325
Paranzella nets					36	6,100	36	6,100
Beam trawls	7	405			9	400	16	805
Fyke nets					2,485	21,640	2,485	21,640
Bag nets					70	2,000	70	2,000
Hoop nets	2,402	7,227	680	995	4,860	13,585	7,942	21,807
Dip nets	67	134			11	64	78	198
Reef nets	8	425					8	425
Pots and traps	4,725	8,152	5,768	4,828	4,187	9,157	14,680	22,137
Wheels	2	1,000	27	107,800			29	108,800
Lines		21,200		1,438		10,845		33,483
Dredges, tongs, hoes, rakes, etc.		4,536		539		1,170		6,245
Abalone outfit						2,160		2,160
Shore and accessory property		7,386,599		2,083,913		2,731,390		12,201,902
Cash capital		543,000		448,809		545,327		1,537,136
Total		14,129,553		4,064,151		5,824,263		24,017,967
PRODUCTS.								
Albacore (or tuna):	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Fresh					21,024,190	$315,622	21,024,190	$315,622
Salted					25,000	481	25,000	481
Anchovies:								
Fresh					81,385	1,730	81,385	1,730
Salted					16,000	1,600	16,000	1,600
Barracuda:								
Fresh					3,262,646	111,690	3,262,646	111,690
Salted					330,000	13,180	330,000	13,180
Bonito					448,256	12,622	448,256	12,622
Carp	200,000	$4,000	50,000	$750	350,815	6,366	600,815	11,116
Catfish					517,054	24,299	517,054	24,299
Cod:								
Fresh	22,025	421	14,400	288			36,425	709
Salted	5,498,284	180,934			4,952,692	161,695	10,450,976	342,629
Croaker					3,150	65	3,150	65

[a] 201,640 yards. [b] 11,840 yards. [c] 10,000 yards. [d] 77,635 yards. [e] 2,465,920 yards. [f] 126,600 yards.

PERSONS ENGAGED, INVESTMENT, AND PRODUCTS OF THE FISHERIES OF THE PACIFIC COAST STATES IN 1915—Continued.

	Washington.		Oregon.		California.		Total.	
PRODUCTS—continued.								
Flounders:	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Fresh	25,855	$736	1,965	$40	6,914,063	$209,291	6,941,883	$210,067
Salted					9,500	475	9,500	475
Grayfish	7,093,996	15,959					7,093,996	15,959
Hake:								
Fresh					221,252	1,937	221,252	1,937
Salted					24,000	960	24,000	960
Halibut	40,590,705	2,041,279	235,169	9,430			40,825,874	2,050,709
Hardhead					73,423	3,622	73,423	3,622
Herring:								
Fresh	2,129,149	9,655	12,500	383	764,384	7,116	2,906,033	17,154
Salted					50,000	1,000	50,000	1,000
Jewfish:								
Fresh					116,461	1,859	116,461	1,859
Salted					138,000	5,020	138,000	5,020
Kingfish					656,003	17,362	656,003	17,362
"Lingcod":								
Fresh	837,110	2,812	12,870	354	570,860	14,687	1,420,840	17,853
Salted					3,500	175	3,500	175
Mackerel:								
Fresh					253,899	6,668	253,899	6,668
Salted					6,450	259	6,450	259
Mullet					3,000	300	3,000	300
Perch	14,750	493	11,930	360	216,785	6,327	243,465	7,180
Pike, Sacramento					15,884	449	15,884	449
Pompano					19,350	2,032	19,350	2,032
Rock bass:								
Fresh					895,284	24,110	895,284	24,110
Salted					2,750	97	2,750	97
Rockfishes:								
Fresh	101,351	2,995	12,000	445	4,336,254	145,816	4,449,605	149,256
Salted					8,000	400	8,000	400
Sablefish	575,810	13,782	15,520	388	64,503	1,359	655,833	15,529
Salmon:								
Blueback	5,043,374	345,710	337,027	16,848			5,380,401	362,558
Chinook—								
Fresh	18,188,160	699,771	23,482,292	1,209,024	7,283,933	338,549	48,954,385	2,247,344
Salted					20,000	2,400	20,000	2,400
Chum	17,156,224	282,842	1,981,879	11,081	38,093	190	19,176,196	294,113
Humpback	29,998,291	367,521					29,998,291	367,521
Silver	18,630,302	543,241	4,844,844	94,137	415,197	12,459	23,890,343	649,837
Sardines:								
Fresh					4,387,706	27,651	4,387,706	27,651
Salted					1,400	80	1,400	80
Sculpin					8,813	345	8,813	345
Sea bass			2,000	60	1,221,262	49,381	1,223,262	49,441
Sea trout					6,083	213	6,083	213
Shad:								
Fresh	96,298	1,164	488,625	4,945	6,846,008	66,982	7,430,931	73,091
Salted					10,000	125	10,000	125
Roe					27,033	2,491	27,033	2,491
Sharks	399,000	889			67,972	236	466,972	1,125
Skates	229,000	515			177,650	868	406,650	1,383
Smelts	2,158,371	25,333	3,500	175	1,137,072	52,978	3,298,943	78,486
Sole	68,062	1,951			5,761,929	108,254	5,829,991	110,205
Spanish mackerel					396,905	11,555	396,905	11,555
Split-tail					17,016	384	17,016	384
Steelhead trout	2,114,141	91,389	2,365,858	75,231	32,405	1,288	4,512,404	167,908
Sting ray					605,000	1,512	605,000	1,512
Striped bass					1,784,448	146,928	1,784,448	146,928
Sturgeon	43,656	2,151	97,785	5,014	16,924	987	158,365	8,152
Sturgeon caviar	300	75					300	75
Sturgeon roe					1,275	708	1,275	708
Surf fish					127,500	7,255	127,500	7,255
Tomcod			22,500	900	41,912	939	64,412	1,839
Whitebait					56,250	2,250	56,250	2,250
Yellowtail:								
Fresh					1,094,416	26,123	1,094,416	26,123
Salted					124,500	4,743	124,500	4,743
Miscellaneous fishes					17,232	539	17,232	539
Abalone:								
Alive					24,026	517	24,026	517
Meat					730,974	16,830	730,974	16,830
Shells					74,000	1,890	74,000	1,890
Pearls and blisters						1,240		1,240
Clams:								
Hard	175,744	12,191			65,856	17,583	241,600	29,774
Soft	1,200	150	22,460	3,041	67,160	18,107	90,820	21,298
Razor	372,750	56,446	77,200	10,900			449,950	67,346

PERSONS ENGAGED, INVESTMENT, AND PRODUCTS OF THE FISHERIES OF THE PACIFIC COAST STATES IN 1915—Continued.

	Washington.		Oregon.		California.		Total.	
PRODUCTS—continued.	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Mussels	700	$83	.....	.....	19,240	$2,326	19,940	$2,409
Oysters:								
Eastern market	265,013	140,028	.....	.....	375,774	165,573	640,787	305,601
Native—								
Market	450,394	250,298	1,547	$725	8,435	6,513	460,376	257,536
Seed	24,808	8,619	.....	.....	.....	.....	24,808	8,619
Octopus	.....	.....	.....	.....	32,309	2,717	32,309	2,717
Squid	15,000	325	.....	.....	6,211,325	32,626	6,226,325	32,951
Crabs	1,734,410	54,526	415,272	13,755	1,414,155	128,434	3,563,837	196,715
Crawfish	.....	.....	183,720	20,747	550	265	184,270	21,012
Shrimp	386,420	18,719	.....	.....	298,000	5,550	684,420	24,269
Spiny lobsters	.....	.....	.....	.....	892,392	130,119	892,392	130,119
Turtles	.....	.....	.....	.....	206	13	206	13
Cod tongues	30,000	2,090	.....	.....	7,400	370	37,400	2,460
Whale oil	2,635,125	112,851	.....	.....	.....	.....	2,635,125	112,851
Whalebone	6,000	4,200	.....	.....	.....	.....	6,000	4,200
Other whale products	1,292,000	24,390	.....	.....	.....	.....	1,292,000	24,390
Sea lion	.....	.....	.....	.....	9,375	4,120	9,375	4,120
Kelp	450,000	191	.....	.....	5,000,000	2,500	5,450,000	2,691
Other seaweeds	.....	.....	.....	.....	6,799	325	6,799	325
Total	159,053,778	5,320,725	34,692,863	1,479,021	93,338,703	2,506,702	287,085,344	9,306,448

SUMMARY OF PERSONS ENGAGED, CAPITAL INVESTED, AND VALUE OF PRODUCTS OF THE FISHERIES OF THE PACIFIC COAST STATES IN CERTAIN YEARS.

Items and States.	1888	1892	1895	1899	1904	1908	1915
PERSONS ENGAGED.							
Washington	3,363	4,310	6,212	9,911	8,829	4,954	14,645
Oregon	3,619	4,332	6,323	5,643	5,299	4,772	5,900
California	4,684	5,403	4,770	3,974	5,530	4,129	8,452
Total	11,666	14,045	17,305	19,528	19,658	13,855	28,997
CAPITAL INVESTED.							
Washington	$1,261,078	$1,593,567	$2,024,469	$6,601,243	$5,319,201	$3,442,000	$14,129,553
Oregon	1,859,299	2,272,351	2,637,412	3,497,643	3,756,692	1,367,000	4,064,151
California	2,081,950	2,526,746	2,612,298	2,774,493	3,764,056	1,659,000	5,824,263
Total	5,202,327	6,392,664	7,274,179	12,873,379	12,839,949	6,468,000	24,017,967
VALUE OF PRODUCTS.							
Washington	810,326	931,568	1,402,433	2,871,438	2,972,633	3,513,000	5,320,725
Oregon	733,867	872,405	1,284,136	855,750	1,185,092	1,356,000	1,479,021
California	2,465,317	3,022,991	1,786,479	2,551,451	2,523,141	1,970,000	2,506,702
Total	4,009,510	4,826,964	4,473,048	6,278,639	6,680,866	6,839,000	9,306,448

QUANTITY AND VALUE OF VARIOUS FISHERY PRODUCTS PREPARED, EXCLUSIVE OF CANNING, IN THE PACIFIC COAST STATES IN 1915.

Method and products.	Washington.		Oregon.		California.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
DRIED.								
Squid					1,200,000	$51,000	1,200,000	$51,000
FROZEN.								
Barracuda	150	$12					150	12
Dolly Varden trout	6,577	345					6,577	345
Finnan Haddie	390	50					390	50
Flounder	280	15					280	15
Halibut	2,551,537	122,052	5,000	$450			2,556,537	122,502
Herring	1,887,645	28,705					1,887,645	28,705
Horse mackerel	250	15					250	15
"Lingcod"	20,235	809					20,235	809
Mackerel	870	45					870	45
Perch	315	20	500	40			815	60
Rockfishes	31,218	1,440					31,218	1,440
Sablefish	281,450	8,423	1,000	80			282,450	8,503
Salmon:								
Chinook	650,805	45,074	95,000	2,700			745,805	47,774
Chum	1,680,718	69,568					1,680,718	69,568
Silver	1,237,158	64,822	75,023	3,384			1,312,181	68,206
Sardines	975	12					975	12
Shad			36,160	1,825			36,160	1,825
Shad roe	150	25	5,123	696			5,273	721
Smelt	105,446	4,673					105,446	4,673
Sole	1,100	44					1,100	44
Spanish mackerel	3,015	200					3,015	200
Steelhead trout	282,025	19,900	377,482	20,785			659,507	40,685
Sturgeon			49,560	6,426			49,560	6,426
Tomcod			500	40			500	40
Shrimp	24,274	2,425					24,274	2,425
Squid	1,035	55					1,035	55
Lobster	617	125					617	125
Miscellaneous	43,892	3,000					43,892	3,000
Total	8,812,127	371,854	645,348	36,426			9,457,475	408,280
MILD-CURED.								
Salmon:								
Chinook	1,208,800	130,052	2,821,027	384,090	1,761,300	187,220	5,791,127	677,162
Chum	83,000	2,060	4,000	240			87,000	2,300
Silver			40,800	4,095			40,800	4,095
Shad			8,000	440	105,000	5,250	113,000	5,690
Steelhead trout			800	80			800	80
Total	1,291,800	132,112	2,874,627	388,945	1,866,300	192,470	6,032,727	713,527
PICKLED.								
Salmon: Chinook					245,000	26,950	245,000	26,950
SALTED.								
Albacore (or tuna)					71,020	3,092	71,020	3,092
Barracuda					8,000	240	8,000	240
Bonito					8,210	328	8,210	328
Halibut	57,100	3,426					57,100	3,426
Herring	47,000	630			100,000	4,500	147,000	5,130
Jewfish					44,998	1,350	44,998	1,350
"Lingcod"	1,000	20					1,000	20
Mackerel					1,896	75	1,896	75
Rock bass					1,000	40	1,000	40
Rockfishes					3,500	122	3,500	122
Sablefish	212,300	9,728					212,300	9,728
Salmon:								
Chinook					160,000	6,500	160,000	6,500
Chum	1,600	800	5,000	225			6,600	1,025
Humpback	10,000	400					10,000	400
Silver	1,444,800	91,489	4,200	377			1,449,000	91,866
Sardines					20,000	2,000	20,000	2,000
Seabass					3,000	120	3,000	120
Shad					4,558,750	63,212	4,558,750	63,212
Spanish mackerel					6,450	258	6,450	258
Yellowtail					37,158	1,301	37,158	1,301
Total	1,773,800	106,193	9,200	602	5,023,982	83,138	6,806,982	190,233

QUANTITY AND VALUE OF VARIOUS FISHERY PRODUCTS PREPARED, EXCLUSIVE OF CANNING, IN THE PACIFIC COAST STATES IN 1915—Continued.

Method and products.	Washington.		Oregon.		California.		Total.	
SMOKED.	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Albacore (or tuna)					7,600	$858	7,600	$858
Cod	50,000	$5,000					50,000	5,000
Halibut	97,050	9,335			10,000	1,500	107,050	10,835
Herring	37,800	1,475			5,000	300	42,800	1,775
Sablefish	279,850	26,163			2,000	45	281,850	26,208
Salmon:								
Chinook	1,525,520	147,793	1,075	$134	10,000	1,500	1,536,595	149,427
Chum	65,560	3,288					65,560	3,288
Silver	2,200	218	500	50			2,700	268
Sturgeon	230	29					230	29
Total	2,058,210	193,301	1,575	184	34,600	4,203	2,094,385	197,688
MISCELLANEOUS.[a]								
Shrimp meat	133,689	38,303					133,689	38,303
Fertilizer	3,854,000	77,560	400,000	7,600	850,000	15,305	5,104,000	100,465
Poultry food	424,000	10,370			1,140,000	28,200	1,564,000	38,570
Glue	400,121	36,200					[b]400,121	36,200
Oil	1,284,338	50,555	225,000	9,000	491,752	19,548	[c]2,001,090	79,103
Ground clamshells	300,000	1,500					300,000	1,500
Total	6,396,148	214,488	625,000	16,600	2,481,752	63,053	9,502,900	294,141
Grand total	20,332,085	1,018,248	4,155,750	442,757	10,851,634	420,814	35,339,469	1,881,819

[a] The fertilizer, poultry food, glue, and oil shown in the above table were prepared from fish and fish offal.
[b] 41,038 gallons.
[c] 266,812 gallons.

SALMON PACK OF THE PACIFIC COAST STATES IN 1915.

Items.	Washington.		Oregon.		California.		Total.	
	Number.	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*
Canneries[a]	59	$5,187,297	28	$1,088,358	5	$289,361	[a]92	$6,565,016
Cash capital		386,300		339,809		55,000		781,109
Persons engaged	4,097		943		590		5,630	
Wages paid		1,199,867		369,799		91,235		1,660,901
PRODUCTS.[b]								
Blueback or sock-eye ....cases	91,720	932,394	4,510	24,915			96,230	957,309
Chinook....do	178,464	1,400,220	292,765	2,246,565	19,508	109,391	490,737	3,756,176
Chum....do	450,409	1,219,061	40,728	104,698			491,137	1,323,759
Humpback....do	590,378	1,772,565					590,378	1,772,565
Silver....do	206,508	1,036,859	53,405	258,038	3,578	16,391	263,491	1,311,288
Steelhead trout ....cases	10,270	64,860	18,783	112,600			29,053	177,460
Total	1,527,749	6,425,959	410,191	2,746,816	23,086	125,782	1,961,026	9,298,557

[a] 26 of these firms were also engaged in other branches of the canning or packing trade, with 6 of whom salmon canning was merely incidental.
[b] All products represent 48 pounds to the case.

COMPARATIVE SUMMARY, BY STATES, OF THE NUMBER OF CASES OF SALMON CANNED IN THE PACIFIC COAST STATES IN CERTAIN YEARS.

States.	Blueback.	Chinook.	Chum.	Humpback.	Silver.	Steelhead trout.	Total.
1892—Washington	19,441	134,253	29,411	.....	28,708	26,945	238,758
Oregon	51,106	237,684	.....	.....	60,293	45,403	394,486
California	.....	14,334	.....	.....	1,550	.....	15,884
Total	70,547	386,271	29,411	.....	90,551	72,348	649,128
1893—Washington	55,237	129,078	23,480	17,530	31,707	25,663	282,695
Oregon	23,074	176,024	9,230	.....	62,913	39,563	310,804
California	.....	26,436	.....	.....	500	.....	26,936
Total	78,311	331,538	32,710	17,530	95,120	65,226	620,435
1894—Washington	53,717	156,549	33,952	9,049	32,118	23,209	308,594
Oregon	25,523	216,507	3,162	.....	100,087	38,829	384,108
California	.....	31,663	.....	.....	500	.....	32,163
Total	79,240	404,719	37,114	9,049	132,705	62,038	724,865
1895—Washington	70,304	157,187	48,686	23,633	81,957	18,985	400,752
Oregon	12,854	316,284	27,027	.....	138,981	30,693	525,839
California	.....	28,635	.....	.....	400	.....	29,035
Total	83,158	502,106	75,713	23,633	221,338	49,678	955,626
1899—Washington	503,950	95,147	42,656	252,733	145,139	2,258	1,041,883
Oregon	19,665	214,821	18,345	.....	78,730	9,736	341,297
California	.....	34,180	.....	.....	.....	.....	34,180
Total	523,615	344,148	61,001	252,733	223,869	11,994	1,417,360
1904—Washington	112,911	140,695	94,265	.....	168,069	3,050	518,990
Oregon	9,264	223,646	15,150	.....	65,557	6,818	320,435
California	.....	17,807	.....	.....	.....	.....	17,807
Total	122,175	382,148	109,415	.....	233,626	9,868	857,232
1908—Washington	.....	.....	.....	.....	.....	.....	460,229
Oregon	.....	.....	.....	.....	.....	.....	340,396
California	.....	.....	.....	.....	.....	.....	3,938
Total	.....	.....	.....	.....	.....	.....	804,563
1915—Washington	91,720	178,464	450,409	590,378	206,508	10,270	1,527,749
Oregon	4,510	292,765	40,728	.....	53,405	18,783	410,191
California	.....	19,508	.....	.....	3,578	.....	23,086
Total	96,230	490,737	491,137	590,378	263,491	29,053	1,961,026

YIELD OF THE FISHERIES OF THE PRINCIPAL RIVERS OF THE PACIFIC COAST STATES IN 1915.

Species.	Chetco River, Oreg.		Columbia River, Wash. and Oreg.		Coquille River, Oreg.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Carp	.....	.....	250,000	$4,750	.....	.....
Salmon:						
Blueback	.....	.....	522,274	25,287	.....	.....
Chinook	30,560	$1,833	29,620,791	1,454,873	207,138	$5,467
Chum	.....	.....	2,274,082	13,958	.....	.....
Humpback	.....	.....	147,924	1,845	.....	.....
Silver	12,270	306	4,372,439	92,170	330,046	5,049
Steelhead	300	10	3,795,452	122,135	12,620	398
Shad: Fresh	.....	.....	580,985	5,947	.....	.....
Smelts	.....	.....	1,625,605	6,748	.....	.....
Sturgeon	.....	.....	133,273	6,793	.....	.....
Sturgeon caviar	.....	.....	300	75	.....	.....
Tomcod	.....	.....	22,500	900	.....	.....
Crawfish	.....	.....	183,720	20,747	.....	.....
Total	43,130	2,149	[a] 43,529,345	1,756,228	549,804	10,914

[a] This does not include 66,000 pounds of chinook salmon, valued at $3,330; 38,093 pounds of chum salmon, valued at $190; and 12,330 pounds of silver salmon, valued at $370, taken in the Columbia River by California fishermen.

YIELD OF THE FISHERIES OF THE PRINCIPAL RIVERS OF THE PACIFIC COAST STATES IN 1915—Continued.

Species.	Eel River, Calif.		Klamath River, Calif.		Necanicum River, Oreg.		Nehalem River, Oreg.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Salmon:								
Chinook	447,306	$17,886	643,000	$14,467			371,024	$9,212
Chum					3,220	$45	176,330	883
Silver	71,972	2,846	174,846	3,497	42,058	850	322,632	6,453
Steelhead	31,605	1,264					23,644	945
Sturgeon	8,010	250						
Total	558,893	22,246	817,846	17,964	45,278	895	893,630	17,493

Species.	Nestucca River, Oreg.		Rogue River, Oreg.		Sacramento River, Calif.		San Joaquin River, Calif.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Carp					95,529	$1,412	63,286	$1,474
Catfish					188,267	7,961	328,787	16,388
Hardhead					68,749	3,476	4,674	146
Pike, Sacramento					10,924	320	4,960	129
Salmon:								
Chinook	161,901	$4,047	1,081,457	$65,001	3,382,370	185,231	200,409	10,390
Silver	174,268	3,485	51,874	1,297				
Steelhead	16,890	675						
Shad:								
Fresh					4,681,710	50,756	561,820	7,172
Salted					10,000	125		
Roe					9,135	872	17,898	1,619
Split-tail					15,550	329	1,466	55
Striped bass					1,271,102	104,432	69,646	5,898
Sturgeon					8,855	732	59	5
Sturgeon roe					1,253	697	22	11
Suckers					689	16	1,375	70
Turtles							22	4
Total	353,059	8,207	1,133,331	66,298	9,744,133	356,359	1,254,424	43,361

Species.	Siletz River, Oreg.		Siuslaw River, Oreg.		Smith River, Calif.		Snake River, Wash.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Salmon:								
Blueback							4,600	$355
Chinook	167,064	$8,197	33,180	$829	61,420	$1,535	48,088	3,757
Chum	36,720	185					984	79
Silver	106,670	1,612	83,306	1,670	15,552	233	5,448	398
Steelhead			1,040	31			85,848	6,781
Sturgeon							1,300	98
Total	310,454	9,994	117,526	2,530	76,972	1,768	146,260	11,468

YIELD OF THE FISHERIES OF THE PRINCIPAL RIVERS OF THE PACIFIC COAST STATES IN 1915—Continued.

Species.	Snohomish River, Wash.		Umpqua River, Oreg.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Carp					408,815	$7,636
Catfish					517,054	24,349
Hardhead					73,423	3,622
Pike, Sacramento					15,884	449
Salmon:						
Blueback	2,250	$180			529,124	25,822
Chinook	44,690	1,564	112,923	$2,265	36,613,321	1,786,554
Chum	42,800	803	5,130	40	2,539,266	15,993
Humpback	13,900	208			161,824	2,053
Silver	304,000	11,695	548,610	10,000	6,615,991	141,561
Steelhead	15,750	945	3,000	120	3,986,149	133,304
Shad:						
Fresh					5,824,515	63,875
Salted					10,000	125
Roe					27,033	2,491
Smelts					1,625,605	6,748
Split-tail					17,016	384
Striped bass					1,340,748	110,330
Sturgeon					150,297	7,788
Sturgeon caviar					300	75
Sturgeon roe					1,275	708
Suckers					2,064	86
Tomcod					22,500	900
Crawfish					183,720	20,747
Turtles					22	4
Total	423,390	15,395	669,663	12,425	60,665,946	2,355,604

COMPARATIVE STATEMENT OF THE CATCH OF INTRODUCED FISHES IN THE PACIFIC COAST STATES IN 1899, 1904, 1908, AND 1915.[a]

WASHINGTON.

Species.	1899		1904		1908		1915	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Carp							200,000	$4,000
Catfish	105,700	$2,114	6,000	$300				
Shad	85,000	1,275	125,287	1,753	100,000	$1,900	96,298	1,164
Total	190,700	3,389	131,287	2,053	100,000	1,900	296,298	5,164

OREGON.

Carp			20,000	$200	30,000	$300	50,000	$750
Catfish	54,360	$1,087	180,000	6,000	201,000	9,000		
Shad	32,000	320	36,846	1,433	431,000	8,000	488,625	4,945
Total	86,360	1,407	236,846	7,633	662,000	17,300	538,625	5,695

CALIFORNIA.

Carp	283,514	$2,400	70,374	$1,407	427,000	$4,300	350,815	$6,366
Catfish	465,911	12,734	737,144	20,992	1,069,000	56,000	517,054	21,299
Shad	1,137,801	14,303	327,372	9,960	1,169,000	12,000	6,858,008	67,107
Striped bass	1,234,230	61,814	1,570,404	92,116	1,776,000	135,000	1,784,448	146,928
Total	3,121,546	91,251	2,705,294	124,475	4,441,000	207,300	9,510,325	244,700

TOTAL.

Carp	283,514	$2,400	90,374	$1,607	457,000	$4,600	600,815	$11,116
Catfish	625,971	15,935	923,144	27,292	1,270,000	65,000	517,054	24,299
Shad	1,254,801	15,898	489,505	13,146	1,700,000	21,900	7,442,931	73,216
Striped bass	1,234,320	61,814	1,570,404	92,116	1,776,000	135,000	1,784,448	146,928
Total	3,398,606	96,047	3,073,427	134,161	5,203,000	226,500	10,345,248	255,559

[a] The statistics for 1908 in this table are from data published by the Bureau of the Census.

FISHERIES OF WASHINGTON.

The fisheries of Washington in 1915 were more extensive than those of Oregon and California combined. The number of persons employed was 14,645, of whom 3,655 were on vessels fishing, 380 on vessels transporting fishery products, 5,481 in the shore or boat fisheries, and 5,129 on shore in canneries and other fishery industries.

The investment amounted to $14,129,553, which includes 472 fishing vessels valued at $2,194,660, with a net tonnage of 11,363 tons, and outfits valued at $578,825; 140 transporting vessels, valued at $689,248, with a net tonnage of 2,213 tons, and outfits valued at $68,895; 299 scows, valued at $142,660, with a net tonnage of 7,258 tons; 1,567 gasoline boats, valued at $645,480; 2,581 sail and other boats, valued at $96,515; fishing apparatus employed on vessels to the value of $308,485; fishing apparatus employed on boats to the value of $1,475,186; shore and accessory property valued at $7,386,599; and cash capital amounting to $543,000.

The products amounted to 159,053,778 pounds, valued at $5,320,725, credited to the different districts as follows: Puget Sound, 84,204,558 pounds, valued at $2,095,547; Columbia River and tributaries, 15,796,175 pounds, valued at $496,339; Grays Harbor, 5,159,682 pounds, valued at $154,505; Willapa Harbor, 2,800,074 pounds, valued at $178,557; and the Pacific Ocean and other waters, 51,209,557 pounds, valued at $2,405,155. The catch of salmon, including steelhead, amounted to 91,130,492 pounds, valued at $2,330,474; halibut, 40,590,705 pounds, valued at $2,041,279; cod, 5,520,309 pounds, valued at $181,355; grayfish, 7,093,996 pounds, valued at $15,959; smelts, 2,158,371 pounds, valued at $25,333; crabs, 1,734,410 pounds, valued at $54,526; and oysters, eastern and native, 740,215 pounds, or 105,745 bushels, valued at $398,945. The whale products included whale oil, 2,635,125 pounds, valued at $112,851; whalebone, 6,000 pounds, valued at $4,200; and other products amounting to 1,292,000 pounds, valued at $24,390.

Compared with the returns for 1904, there was an increase of 65.87 per cent in the number of persons employed, 165.63 per cent in the amount of capital invested, and of 78.80 per cent in the quantity and 78.99 per cent in the value of the products. The products also show an increase of 58.33 per cent in the quantity and 51.45 per cent in the value over those in the returns for 1908, published by the Bureau of the Census.

For statistics as to the number of persons employed, amount of capital invested, and the quantity and value of the products of the fisheries of Washington in 1915, see table, page 51. Statistics as to the approximate catch of certain fishery products of Washington by districts in 1915 are contained in the following table:

APPROXIMATE CATCH OF CERTAIN FISHERY PRODUCTS OF WASHINGTON, BY DISTRICTS, IN 1915.

Species.	Puget Sound.		Columbia River.a		Grays Harbor.		Willapa Harbor.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Carp			200,000	$4,000					200,000	$4,000
Flounders	25,855	$736							25,855	736
Grayfish	7,093,996	15,959							7,093,996	15,959
Herring	2,129,149	9,655							2,129,149	9,655
"Lingcod"	836,960	2,810							836,960	2,810
Perch	14,750	493							14,750	493
Rockfishes	80,351	2,472							80,351	2,472
Salmon:										
Blueback	3,605,737	279,112	189,847	8,794	1,242,530	$57,353	3,010	$271	5,041,124	345,530
Chinook	7,554,283	303,352	9,214,877	367,474	896,550	16,607	567,760	11,374	18,143,470	698,207
Chum	14,707,440	269,152	821,042	5,616	1,228,227	5,582	356,715	1,659	17,113,424	282,039
Humpback	29,816,167	365,213	147,924	1,845	18,340	230	1,960	25	29,984,391	367,313
Silver	14,753,946	455,908	1,877,121	42,320	1,209,360	23,598	485,875	9,720	18,326,302	531,546
Shad	3,938	162	92,360	1,002					96,298	1,164
Sharks	399,000	889							399,000	889
Skates	229,000	515							229,000	515
Smelts	532,766	18,585	1,625,605	6,748					2,158,371	25,333
Sole	68,062	1,951							68,062	1,951
Steelhead trout	400,529	28,071	1,590,311	56,538	98,633	5,317	8,918	498	2,098,391	90,444
Sturgeon	5,778	295	36,788	1,877	1,890	57	400	12	44,856	2,241
Sturgeon caviar			300	75					300	75
Clams:										
Hard	175,744	12,191							175,744	12,191
Soft							1,200	150	1,200	150
Razor					297,430	37,736	75,320	18,710	372,750	56,446
Mussels	700	83							700	83
Oysters:										
Eastern, market	84,910	47,549			875	525	179,228	91,954	265,013	140,028
Native—										
Market	440,685	245,543					9,709	4,755	450,394	250,298
Seed	12,607	3,390					12,201	5,229	24,808	8,619
Squid	15,000	325							15,000	325
Crabs	380,785	12,226			255,847	8,100	1,097,778	34,200	1,734,410	54,526
Shrimp	386,420	18,719							386,420	18,719
Kelp	450,000	191							450,000	191
Total	84,204,558	2,095,517	15,796,175	496,339	5,159,682	154,505	2,800,074	178,557	107,960,489	2,924,948

aThe data for the Columbia River comprise those for all of its tributaries including the Snake River, which is also shown separately in another table.

FISHERIES BY COUNTIES.

In 1915 commercial fishing was prosecuted in 25 counties in Washington. These include counties bordering on Puget Sound, the Pacific Ocean, and the Columbia River and tributaries. This report shows salmon, including steelhead trout, taken commercially as far from the coast as in the Snake River opposite Lewiston, Idaho. No commercial fishing, however, is followed from the latter State, as its laws discourage all but hook-and-line fishing. Practically the entire catch of the Snake River is made with seines and consists mainly of steelhead trout and chinook salmon; a few blueback, chum, and silver salmon, and sturgeon are also taken.

King County.—This county supports the most valuable fisheries of the State, due mainly to the fact that Seattle is located within its boundaries. Most of the State's salmon and halibut fleets are owned and operated from this city. Among other important fisheries centered here are the gill-net and troll fisheries. In 1915 the products of the fisheries of this county amounted to 54,993,930 pounds, with a value to the fishermen of $2,204,124. The two most important items of this total are 33,642,389 pounds of halibut, valued at $1,691,211, and 16,934,501 pounds of the various species of salmon, including steelhead trout, valued at $406,981. Salted cod amounting to 2,220,000 pounds, with a value of $73,980, is also an important item. These fish are taken and salted in Alaskan waters and brought back to the State for repacking and shipment.

Whatcom County.—The output of the fisheries of this county in 1915 amounted to 20,546,494 pounds, having a value to the fishermen of $493,887, consisting mainly of salmon. Most of these are taken with pound nets and gill nets in the shore fisheries and with purse seines in the vessel fisheries. This county, being very convenient to the fishing grounds, has many of the largest salmon canneries of the State. Bellingham and Blaine are the centers of the canning, as well as of the fishing, industry of the county.

Skagit County.—The fisheries of this county ranked next in importance to those of Whatcom County, the output amounting to 14,693,537 pounds, valued at $427,988. This county is also convenient to the salmon-fishing grounds, and owes its extensive fisheries to that fact. With the exception of a few cases of salmon packed at La Conner, all of the county's salmon pack was put up at Anacortes, where eight canneries were in operation in 1915. Extensive pound-net and purse-seine fisheries are also operated from here. La Conner supports valuable gill-net fisheries, the catch being taken to Anacortes. Included in the total output of the county are 3,278,284 pounds of salted cod, valued at $106,954, taken in Alaskan waters by schooners owned at Anacortes. Samish, in this county, is the most northern point in the State at which oysters are taken. In 1915, 2,400 bushels of eastern oysters, worth $9,000, and 480 bushels of native oysters, worth $1,890, were marketed from private beds in Samish Bay.

Pierce County.—Fishing is followed from many places in this county, but the most important fishing center in the county is Tacoma, where a large number of purse-seine vessels are owned and operated. Several halibut vessels also fish from this port. No salmon canning is done in this county, but large quantities of fish are handled at

Tacoma, either in a fresh, frozen, salted, or smoked condition. This county leads in the value of its shrimp fisheries, 201,332 pounds, having a value to the fishermen of $9,171, being credited to it in 1915. The meat of more than one-half of these shrimps is extracted by Tacoma dealers before selling. The total output of fishery products in the county was 15,861,531 pounds, valued at $408,964, as compared with 7,255,164 pounds, valued at $196,824, in 1904.

Pacific County.—This county ranks fifth in the value of its fishery products. The salmon fisheries are the most important, but there are also several others deserving of mention. The total production in 1915 amounted to 8,701,774 pounds, with a value to the fishermen of $398,845, showing a decline since 1904 of 427,074 pounds and of $169,350 in value. The transplanting and raising of oysters from eastern seed is an important industry in this county. In 1915 31,821 bushels were taken up and sold by the owners for $115,109. Native oysters to the amount of 1,412 bushels, valued at $4,830, were also sold, showing a great decline in production since 1904, when the last canvass by the Bureau was made. Among other items of interest were $34,400 worth of crabs and $18,710 worth of razor clams. The most valuable fisheries of the county are located at Chinook, near the mouth of the Columbia River, where pound nets are used almost exclusively. Bay Center is the center of the crab, and Nahcotta and vicinity of the razor clam, industry.

Grays Harbor County.—The products of this county, formerly named Chehalis, in 1915 amounted to 9,793,354 pounds, valued at $317,158. The most important items of this total are whale products, valued at $134,441. Three steamers are employed in this industry from Bay City, Wash., where a plant is located, to which the whales are brought for the manufacture of fertilizer and oil. This county differs from the four preceding counties in that the salmon fisheries hold second place instead of first. The most valuable razor-clam industry in the State is located in this county. Practically all of these clams are utilized in canneries located within the county. Aberdeen is the most important fishing and canning center.

Thurston County.—Olympia is the only fishing locality of any importance in this county. In this town and vicinity is centered the native oyster industry of the State. Out of a total for the county of 747,521 pounds of products, valued at $244,209, the oyster industry contributed 294,296 pounds, or 56,328 bushels, of native oysters, valued at $219,818, and 14,091 pounds, or 2,013 bushels, of eastern oysters, valued at $9,394. Seed oysters to the amount of 3,794 pounds, or 542 bushels, with an estimated value of $813, are also shown. Shrimp, smelt, and clams are important items in the total output.

Kitsap County.—The fisheries of this county in 1915 amounted to 9,905,345 pounds, with a value to the fishermen of $235,980, as compared with 1,052,928 pounds, valued at $38,019, in 1904. One-half of the value in 1915 is credited to halibut taken by vessels owned at various localities in the county. The next most important is the salmon fishery, the output of which amounted to 4,905,529 pounds, valued at $97,081. Several vessels were engaged in taking herring, the total catch amounting to 1,335,049 pounds, valued at $6,035. These were sold mainly for halibut bait. The smelt fishery is of some importance, the catch amounting to 94,175 pounds, valued at

$3,381. Two clam canneries at Bangor utilize most of the clams taken on the western side of the county bordering on Hood Canal. Those taken on the eastern side are sold mostly in Seattle. There are a great many fishing localities in this county, but none of great importance. There were 65 fishing vessels in the county, which constituted an important factor in its fisheries.

Wahkiakum County.—The total output of this county amounted to 3,808,288 pounds, valued at $142,308, showing a decline since 1904 of 5,561,387 pounds in quantity and of $234,203 in value. The catch consisted almost entirely of salmon taken in the Columbia River. The gill-net fisheries are the most important, but the pound-net fisheries at Cathlamet and vicinity contribute about one-third of the total production of the county. That town has very important gill-net fisheries also and ranks as the most important fishing center on the Columbia River. Canneries at Altoona, Brookfield, Cathlamet, and Eaglecliff utilize large quantities of salmon. A considerable quantity is also smoked at Altoona. A few shad are put up at the Altoona and Eaglecliff canneries. A very small number of cases of shad roe were also canned at Altoona.

Snohomish County.—The fishery production of this county in 1915 amounted to 3,253,395 pounds, valued at $78,860, showing an increase since 1904 of 1,566,830 pounds in quantity and of $42,554 in value. The catch consisted almost wholly of salmon. Everett is the important fishing center of the county, and has a large fleet of salmon purse-seine vessels. The gill-net fishery of this city is prosecuted in the Snohomish River as far up as Snohomish, but one man fishes his gill nets in the Gulf of Georgia. Four canneries at Everett utilized large quantities of salmon. A considerable number of chinook salmon were also kippered here. Many herring are frozen for use later as halibut bait.

Clallam County.—This county has the Strait of Juan de Fuca as its northern, and the Pacific Ocean as its western, boundary. Its fisheries in 1915 amounted to 2,219,016 pounds, valued at $56,011, of which 2,090,829 pounds, valued at $50,876, were salmon. Besides the latter, some halibut, rockfishes, clams, and crabs were taken. Neah Bay and Port Angeles are the leading fishing centers of the county. Trolling for salmon is extensively followed at both places, mainly in the Pacific Ocean off Neah Bay. The catch is handled by a cannery at Neah Bay and buyers representing wholesale firms at Seattle and Tacoma. A cannery at Mora, on the Pacific coast, utilized the salmon caught in that neighborhood. This firm went out of business in 1916. One firm at Port Williams canned both salmon and clams, most of the latter being taken in Hood Canal. A few men at Dungeness follow crabbing for several months of the year. The returns for all of the fisheries in 1915 show an increase of 221,661 pounds in quantity and $6,397 in value since 1904.

San Juan County.—This county is conveniently located near the salmon-fishing grounds of Puget Sound, but the population seems to favor farming more than fishing. A fleet of 13 vessels, however, is an important factor in the fishing industry of the county. Friday Harbor, with a population of 400, is the only important fishing town in the county and is more important through its salmon canning than through its fisheries. Besides the two canneries here, there are also two at Richardson, one at Shaw Island, and one at Deer Harbor. In

1915 a small plant at Port Stanley was engaged in making potash and fertilizer from kelp. The total fishery output of this county in 1915 amounted to 3,025,282 pounds, valued at $40,043, as compared with 3,180,326 pounds, valued at $103,899, in 1904. This shows a decrease of 155,044 pounds, and a proportionately greater decrease of $63,856 in value, which occurred mainly in bluebacks and chinooks.

Mason County.—This county ranks third in the State in the value of its oyster fisheries, being exceeded only by Pacific and Thurston Counties. In 1915 the total catch of oysters amounted to 7,512 bushels, valued at $26,815. Of these, 5,522 bushels, valued at $22,035, were native oysters; 750 bushels, valued at $2,250, were eastern oysters; and 1,240 bushels, with an estimated value of $2,530, were seed oysters. It is contrary to law to sell seed oysters, and they are taken up and used solely by oyster planters on their private beds. The clam industry is also of considerable importance, 8,000 bushels, with a value of $4,111, being marketed in 1915. Shelton is the center of the county's fishery industries. The total output of Mason County in 1915 amounted to 293,304 pounds, with a value to the fishermen of $36,104, showing a decline since 1904 of 1,875,420 pounds and of $34,017, accounted for mainly through the decline of the native oyster industry, which was affected by a freeze occurring during the 1915 season. The catch of salmon was also smaller in 1915 than in 1904.

Island County.—The fisheries of this county are not important as compared with those counties already mentioned, the total production in 1915 amounting to 1,856,919 pounds, valued at $19,611, as compared with 5,489,089 pounds, valued at $125,486, in 1904. The decline is mostly in the salmon fisheries. As in San Juan County, the population includes more farmers than fishermen. In 1915 there was a fleet of only three fishing vessels, notwithstanding its proximity to the prolific salmon-fishing grounds of Puget Sound. Besides salmon, the important fisheries are the crab, smelt, and grayfish. The catch of grayfish was more than one-half of the total catch of the county, but the value was less than one-seventh. During that year they were used entirely for fertilizer and oil. There are no canneries and no fishing centers of importance in the county.

Jefferson County.—Out of a total output of 3,919,316 pounds, valued at $74,197, 2,572,837 pounds, valued at $53,785, are credited to the pound-net fishery operated from Port Townsend. Two large salmon canneries are located at Port Townsend, and also a plant utilizing large quantities of grayfish in the preparation of fertilizer, poultry food, and oil. Hard clams and eastern oysters from private beds are among the products of this county. The returns for 1915 show an increased production over 1904 of 2,148,100 pounds and of $43,425.

Cowlitz County.—This county depends for its fish supply upon the Columbia River, which forms part of its western and southern boundaries; but the Cowlitz River, one of its tributaries, passing through the county from north to south, also furnishes considerable quantities. In 1915, 1,609,500 pounds of eulachon, or candlefish tabulated as smelt, valued at $6,500, were taken from one of the small tributaries of the Cowlitz River. These fish are taken in the vicinity of Kelso during January, February, and March. Such large quantities are secured within so short a period of time that it is difficult

to dispose of them at a profitable price, the latter ranging from $5 at the beginning to as low as 10 cents per box, holding 50 pounds, at the height of the season. Carrollton and Kalama are the most important fishing localities in the county, both of them supporting profitable pound-net fisheries. Gill netting and seining are also followed to some extent. Aside from 300,000 pounds of salmon frozen at Kalama, most of the catch was handled fresh by two firms at Kalama and Kelso. The total output of the county in 1915 was 3,935,756 pounds, valued at $73,643, as compared with 1,514,562 pounds, valued at $35,864, in 1904.

Clarke County.—The total yield of the fisheries of this county in 1915 was 1,016,122 pounds, valued at $44,584. The salmon fisheries are the most important in the county, though $4,000 worth of carp, taken from sloughs formed by overflow water from the Columbia River, forms an important item. These fish are shipped mainly to Seattle and Portland, and some are sent as far east as Butte, Mont. Vancouver is the most important fishing locality in the county.

Lewis County.—The fisheries of this county are unimportant, amounting in 1915 to 11,571 pounds, valued at $542, consisting of salmon taken mostly in the Chehalis and Cowlitz Rivers. No fisheries were shown for this county in 1904.

Skamania and Klickitat Counties.—These counties, situated on the upper Columbia River, represent the upper limit of fishing on that river. In fact, no commercial fishing of importance is done on the Washington side above Grand Dalles, in Klickitat County. Aside from a few sturgeon taken on set lines, the catch of Skamania County consisted entirely of salmon. The catch of Klickitat County consisted also of salmon which were taken both in gill nets and pound nets, the catch in the latter predominating. The catch of the two counties in 1915 combined was 325,055 pounds, valued at $12,249, showing a loss since 1904 of 674,032 pounds and $16,591.

Franklin, Columbia, Garfield, Whitman, and Asotin Counties.—These counties are all situated on the Snake River, and the catch credited to them represents the total output of that river. Aside from the use of a few set lines for sturgeon and gill nets for salmon, the seine is the only form of apparatus used on the river. A few bluebacks are taken, but the greater part of the catch consists of chinook, silver, and steelhead. The uppermost point on the river, where commercial fishing is followed, is just above Clarkston, Wash., or Lewiston, Idaho. The most important catches of the river are made at this point. The fishing is followed in February and March, and again in August, September, and October. Except for some shipped to Spokane and near-by towns, the catch is sold locally. The total output of the five counties in 1915 amounted to 146,268 pounds, valued at $11,468.

PERSONS ENGAGED, INVESTMENT, AND PRODUCTS OF THE FISHERIES OF WASHINGTON IN 1915, BY COUNTIES.

	Asotin.		Clallam.		Clarke.		Columbia.		Cowlitz.		Franklin.		Garfield.		Grays Harbor.		Island.	
PERSONS ENGAGED.	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*
On vessels fishing															68		20	
On vessels transporting			2						2						12			
In shore fisheries	38		244		92		5		177		5		9		859		129	
On shore, in canneries, etc			107						18						741			
Total	38		353		92		5		197		5		9		1,680		149	
INVESTMENT.																		
Vessels fishing															9	$161,200	3	$9,000
Tonnage															377		46	
Outfit																11,135		910
Vessels transporting			1	$4,000					2	$3,000					6	13,750		
Tonnage			10						12						53			
Outfit				625						400						1,375		
Scows (5 tons and over)			2	1,400											5	2,475		
Tonnage			42												204			
Boats:																		
Gasoline			90	32,350	55	$18,950			122	29,450	1	$400			99	34,445	42	15,050
Sail, row, etc	11	$230	128	2,020	34	2,815	2	$30	64	2,790	2	30	3	$45	193	4,510	62	925
Apparatus, vessel fisheries:																	3	2,400
Seines																	1,550	
Length in yards																2,000		
Whaling apparatus																750		
Lines																		
Apparatus, shore fisheries:																		
Seines	7	650	4	725	1	125	2	160	2	700	1	100	3	300			33	1,945
Length in yards	750		635		150		225		670		115		350				2,310	
Gill nets	5	275	45	1,260	64	22,660			236	50,380					344	24,590		
Length in yards	425		2,675		25,750				66,315						48,748			
Pound nets					6	4,200			21	7,200					26	20,300		
Hoop nets															365	1,290		
Dip nets					4	8			62	124								
Pots			135	200											525	1,050	2,270	4,540
Lines				3,425		75						30				500		980
Dredges, tongs, rakes, etc				7												846		6

Shore and accessory property		800		154,980		1,065		100		32,645		100		110		371,670		650
Cash capital				16,500						5,600						75,700		
Total		1,955		217,492		49,898		290		132,289		660		455		727,586		36,406
PRODUCTS.	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Carp					200,000	$4,000											1,080,000	$2,429
Grayfish															413,000	$21,607		
Halibut			42,000	$1,920											150	2		
"Lingcod"																	500	15
Perch															21,000	523	1,000	35
Rockfishes			57,000	1,425														
Salmon:					9,710	484			9,880	$457			2,250	$180	1,242,530	57,353	5,800	444
Blueback or sockeye	1,100	$88			655,325	36,711	10,125	$759	1,782,875	55,586	2,490	$199	14,640	1,170	912,005	18,745	62,484	1,683
Chinook	17,160	1,372	384,426	9,614	17,100	85			165,350	826	984	79			1,340,262	6,145	50,024	717
Chum			50,376	691					240	3					19,170	240	80,428	992
Humpback			61,050	1,482					180,020	4,179	680	54			1,316,670	25,969	283,348	7,266
Silver	1,080	86	1,594,977	39,089	33,800	877			19,200	293								
Shad					19,550	197											64,000	141
Sharks																	44,000	99
Skates																	71,500	2,543
Smelts					12,550	126			1,609,500	6,580							500	20
Sole													10,136	811	105,350	5,714	158	10
Steelhead trout	62,128	4,971			65,537	1,971	9,600	720	161,966	5,383	1,200	90			1,940	58		
Sturgeon					2,550	133			6,725	336							552	45
Clams:																		
Hard			2,520	190											297,430	37,736		
Razor															875	525		
Oysters: Eastern, market															255,847	8,100	112,625	3,172
Crabs			26,667	1,600											2,575,125	110,051		
Whale oil															1,292,000	24,390		
Other whale products																		
Total	81,468	6,517	2,219,016	56,011	1,016,122	44,584	19,725	1,479	3,935,756	73,643	5,354	422	27,026	2,161	9,793,354	317,158	1,856,919	19,611

PERSONS ENGAGED, INVESTMENT, AND PRODUCTS OF THE FISHERIES OF WASHINGTON IN 1915, BY COUNTIES—Continued.

	Jefferson.		King.		Kitsap.		Klickitat		Lewis.		Mason.		Pacific.		Pierce.		San Juan.	
PERSONS ENGAGED.	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*
On vessels fishing	11		1,779		430								11		523		85	
On vessels transporting	18		39		2								13		12		22	
In shore fisheries	166		496		225		7		15		92		717		208		106	
On shore, in canneries, etc	156		432		13						8		171		97		339	
Total	351		2,746		670		7		15		100		912		840		552	
INVESTMENT.																		
Vessels fishing	2	$6,500	206	$1,162,110	65	$176,500							5	$19,000	59	$290,400	13	$40,300
Tonnage	18		5,845		880								39		1,377		179	
Outfit		875		404,550		37,575								1,410		52,225		5,280
Vessels transporting	7	30,100	16	54,500	2	4,500							10	23,400	6	22,500	10	43,500
Tonnage	88		212		17								78		78		125	
Outfit		4,350		7,670		250								1,685		2,450		3,625
Scows (5 tons and over)	18	12,550	7	3,900											2	1,400	16	10,300
Tonnage	734		173												37		375	
Boats:																		
Gasoline	33	12,650	157	103,200	82	35,950	4	$1,050			28	$10,575	302	116,425	70	41,710	22	12,800
Sail, row, etc	93	2,710	180	7,275	127	1,920	5	390	15	$170	87	1,785	336	10,820	130	6,270	40	2,165
Apparatus, vessel fisheries:																		
Seines	1	900	138	92,090	68	42,230									61	41,700	13	9,900
Lengths in yards	500		77,065		32,275										32,975		6,550	
Gill nets			4	50														
Length in yards			640															
Beam trawls			7	215											5	625		
Hoop nets													25	70				
Pots			20	25											200	300		
Whaling apparatus				50														
Lines		210		37,965		2,675										4,550		
Dredges													8	200				
Apparatus, shore fisheries:																		
Seines	12	825	21	5,070	38	2,885					15	960	2	600	20	1,350	3	915
Length in yards	1,310		4,855		3,615						1,565		800		1,695		585	
Gill nets	4	120	312	27,668	33	2,995	5	100	15	295	6	305	221	44,060	97	2,970	6	875
Length in yards	295		66,440		7,820		170		435		1,050		66,720		8,540		2,500	
Beam trawls					3	55									1	125		
Pound nets	8	60,000	27	127,000	4	9,700	6	2,500					197	133,950	1	5,000	4	17,700
Hoop nets													2,037	5,937				

Reef nets																			6	345
Pots	25	37	60	75											150	225				
Wheels													2	1,000						
Lines		920		3,689		1,242						110		3,670		2,047				400
Dredges, tongs, rakes, etc		33		3		52						400		1,702		6				5
Shore and accessory property		206,171		1,444,075		8,450		550				5,725		212,250		247,625				413,451
Cash capital		15,000		74,800		1,500						2,000		47,200		18,000				35,000
Total		353,951		3,555,980		328,479		4,590		465		21,860		623,379		741,478				596,561
PRODUCTS.																				
Cod:	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Lbs.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*		
Fresh			15,525	$281	6,500	$140														
Salted			2,220,000	73,980																
Flounders	6,000	$120	1,255	21	16,600	575									2,000	$20				
Grayfish	1,180,000	2,649	704,662	1,587	980,000	2,209									1,529,334	3,441	820,000	$1,844		
Halibut	43,000	2,660	33,642,389	1,691,211	2,401,956	120,754									4,003,260	201,257	100	10		
Herring	10,700	80	441,200	2,064	1,335,049	6,035									45,000	200				
"Lingcod"	3,300	97	42,160	899	1,000	25														
Perch	5,500	140	2,150	93	1,900	94					1,000	$40			3,700	111				
Rockfishes	5,000	300	8,201	289	5,150	278					1,000	35					2,000	70		
Sable fish			526,810	12,557	27,000	675									21,000	525				
Salmon:																				
Blueback, or sockeye	24,680	1,983	657,182	50,602	172,450	14,554	20,940	$1,047	75	$7			112,357	$4,837	291,575	25,154	61,105	5,498		
Chinook	637,136	21,866	1,450,927	69,664	199,462	6,086	66,245	3,013	7,930	418	13,883	516	4,371,135	155,126	293,334	12,101	133,517	3,357		
Chum	278,112	3,627	4,510,124	96,472	1,742,524	29,194			385	5	22,840	153	506,582	2,511	3,536,170	56,266	121,168	1,967		
Humpback	839,494	10,493	7,166,451	78,336	2,030,192	22,813	1,104	13			782	11	2,160	27	4,406,756	52,974	1,023,308	12,860		
Silver	760,360	23,145	2,983,403	99,126	756,249	24,103	66,600	1,500	2,710	77	73,040	2,118	1,458,686	29,985	1,321,364	42,331	367,240	13,575		
Shad			3,878	160									21,626	187						
Sharks	42,000	93	180,000	404	16,000	35									70,000	157	22,000	48		
Skates	26,000	60	78,000	173	12,000	27									48,000	108	18,000	41		
Smelts	7,300	355	53,600	1,784	94,175	3,381					62,300	2,180	55	2	30,300	1,050	2,076	74		
Sole	1,000	30	10,562	351	56,000	1,550														
Steelhead trout	22,160	1,322	166,414	12,781	4,652	331	40,024	1,301	471	35	1,875	125	786,043	26,833	8,232	626	288	18		
Sturgeon	2,380	68	2,480	172	78	5							17,100	784						
Sturgeon caviar													300	75						
Clams:																				
Hard	17,944	1,269	864	110	35,760	2,371					64,000	4,111			5,680	425	4,480	490		
Soft													1,200	150						
Razor													75,320	18,710						
Oysters:																				
Eastern, market	5,250	3,750									5,250	2,250	222,747	115,109						
Native—																				
Market											38,654	22,035	9,884	4,830	4,200	1,725				
Seed											8,680	2,530	12,201	5,229	133	47				
Squid															15,000	325				
Crabs	2,000	90	3,243	121									1,104,378	34,400	25,161	950				

PERSONS ENGAGED, INVESTMENT, AND PRODUCTS OF THE FISHERIES OF WASHINGTON IN 1915, BY COUNTIES—Continued.

PRODUCTS—continued.	Jefferson.		King.		Kitsap.		Klickitat.		Lewis.		Mason.		Pacific.		Pierce.		San Juan.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Lbs.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Lbs.*	*Value.*
Shrimp			44,450	$3,050	10,648	$745									201,332	$9,171		
Cod tongues			12,000	836														
Whale oil			60,000	2,800														
Whalebone			6,000	4,200														
Kelp																	450,000	$191
Total	3,919,316	$74,197	54,993,930	2,204,124	9,905,345	235,980	194,913	$6,874	11,571	$542	293,304	$36,104	8,701,774	$298,845	15,861,531	408,964	3,025,282	40,043

PERSONS ENGAGED.	Skagit.		Skamania.		Snohomish.		Thurston.		Wahkiakum.		Whatcom.		Whitman.		Total.	
	Number.	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*
On vessels fishing	271				137		8		7		305				3,655	
On vessels transporting	70				26		3		14		145				380	
In shore fisheries	453		27		262		162		355		621		11		5,481	
On shore, in canneries, etc	1,111				240		79		223		1,473				5,208	
Total	1,905		27		665		252		599		2,541		11		14,724	
INVESTMENT.																
Vessels fishing	20	$97,150			20	$57,000	4	$6,400	1	$1,900	51	$167,200			472	$2,194,660
Tonnage	1,435				287		29		6		845				11,363	
Outfit		29,230				11,110		1,200		450		22,575				578,825
Vessels transporting	24	213,698			5	17,500	3	5,300	7	13,700	41	239,800			140	689,248
Tonnage	547				76		21		58		838				2,213	
Outfit		16,175				3,875		1,000		1,825		23,590				68,895
Scows (5 tons and over)	87	35,775			9	8,300					151	66,560			297	142,660
Tonnage	1,644				285						3,764				7,258	
Boats:																
Gasoline	106	48,250	15	$2,775	48	29,000	23	13,100	188	57,075	80	30,275			1,567	645,480
Sail, row, etc	333	15,575	17	895	230	4,515	129	5,175	109	6,500	296	18,350	5	$75	2,631	98,015
Apparatus, vessel fisheries:																
Seines	15	12,350			20	12,685	2	120	1	900	52	41,600			374	256,875
Length in yards	8,200				10,305		145		400		27,975				197,940	
Gill nets					1	400									5	450
Length in yards					600										1,240	
Beam trawls							4	600							16	1,440

Hoop nets											60	200			85	270
Pots															220	325
Whaling apparatus																2,050
Lines		400			250											46,800
Dredges	2	75													10	275
Apparatus, shore fisheries:																
Seines	11	2,100			2	150	13	1,350	2	600	5	1,350	3	285	200	23,145
Length in yards	2,140				200		1,325		800		875		370		25,340	
Gill nets	403	20,831	39	3,030	350	8,480	1	175	365	76,725	326	21,030	1	35	2,878	308,859
Length in yards	55,175		4,220		21,230		450		134,365		58,725		30		572,078	
Beam trawls							3	225							7	405
Pound nets	41	176,653							38	30,400	65	505,500			444	1,100,103
Hoop nets															2,402	7,227
Dip nets									1	2					67	134
Reef nets											2	80			8	425
Pots	630	645			80	155					850	1,225			4,725	8,152
Wheels															2	1,000
Lines		1,752		20		1,190						1,150				21,200
Dredges, tongs, rakes, etc		4				10		1,455				7				4,536
Shore and accessory property		1,403,369		35		387,117		54,985		342,804		2,097,832		150		7,386,709
Cash capital		62,000				18,200		14,500		31,000		126,000				543,000
Total		2,136,032		6,755		560,267		105,585		563,881		3,364,324		545		14,131,163

PRODUCTS.	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Carp															200,000	4,000
Cod:																
Fresh															22,025	421
Salted	3,278,284	$106,954													5,498,284	180,934
Flounders															25,855	736
Grayfish											800,000	$1,800			7,093,996	15,959
Halibut					45,000	$1,860									40,590,705	2,041,279
Herring	2,200	22			275,000	1,169					20,000	85			2,129,149	9,655
"Lingcod"	790,500	1,789													837,110	2,812
Perch															14,750	493
Rockfishes	1,000	40													101,351	2,995
Sablefish					1,000	25									575,810	13,782
Salmon:																
Blue-back, or sockeye	557,770	47,930	7,755	$386	80,670	6,453	7,780	$690	23,645	$1,181	1,752,870	126,295	1,250	$87	5,043,374	345,710
Chinook	2,036,367	82,328	95,375	4,384	209,860	6,779	330	20	2,600,571	115,293	2,226,885	92,724	3,673	257	18,188,160	699,771
Chum	1,840,300	36,329	8,750	43	500,718	9,398	840	5	233,014	1,193	2,230,604	37,136			17,156,224	282,842
Humpback	3,879,170	57,081			1,120,508	16,796	29,644	480	4,900	61	9,332,934	112,859			29,998,291	367,521
Silver	2,040,040	71,658	5,000	112	975,608	33,928	4,068	135	468,888	10,441	3,932,783	113,229	3,688	258	18,630,302	543,241
Shad	483	15	100	1					31,461	311					96,298	1,164
Sharks											5,000	11			399,000	889
Skates											3,000	7			229,000	515
Smelts	44,191	1,331			1,406	50	121,988	4,275	3,500	40	43,930	1,562			2,158,371	25,333

PERSONS ENGAGED, INVESTMENT, AND PRODUCTS OF THE FISHERIES OF WASHINGTON IN 1915, BY COUNTIES—Continued.

PRODUCTS—continued.	Skagit.		Skamania.		Snohomish.		Thurston.		Wahkiakum.		Whatcom.		Whitman.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Sole															68,062	$1,951
Steelhead trout	137,439	$8,974	10,662	$319	31,865	$1,910			436,549	$13,471	48,608	$3,484	3,984	$279	2,114,141	91,389
Sturgeon	840	50	2,500	130					5,763	317			100	8	43,656	2,151
Sturgeon caviar															300	75
Clams:																
Hard	176	25			1,760	242	40,000	$2,743			2,008	170			175,744	12,191
Soft															1,200	150
Razor															372,750	56,446
Mussels							700	83							700	83
Oysters:																
Eastern, market	16,800	9,000					14,091	9,394							265,013	140,028
Native—																
Market	3,360	1,890					394,296	219,818							450,394	250,298
Seed							3,794	813							24,808	8,619
Squid															15,000	325
Crabs	46,617	1,318			10,000	250					147,872	4,255			1,734,410	54,526
Shrimp							129,990	5,753							386,420	18,719
Cod tongues	18,000	1,254													30,000	2,090
Whale oil															2,635,125	112,851
Whalebone															6,000	4,200
Other whale products															1,292,000	24,390
Kelp															450,000	191
Total	14,693,537	427,988	130,142	5,375	3,253,395	78,860	747,521	244,209	3,808,288	142,308	20,546,494	493,887	12,695	889	159,053,778	5,320,725

PRODUCTS BY APPARATUS.

The following are the different forms of apparatus used in the fisheries of Washington, in the order of their importance, based on the value of their catch. The kinds of apparatus, such as dredges, tongs, etc., used in taking oysters, clams, and mussels are so varied that they are not given any particular ranking on the basis of catch.

Lines.—Lines are used both in the vessel and shore fisheries, but their importance is due mainly to their use in the halibut vessel fisheries. The total catch of all species by lines in 1915 amounted to 58,923,651 pounds, with a value to the fishermen of $2,446,323. Of this amount, halibut contributed 40,590,705 pounds, valued at $2,041,279. The total catch by lines in 1904 amounted to only 15,897,155 pounds, valued at $458,375.

Trolling.—Trolling has in recent years become one of the important fisheries of Washington. It is followed in Neah Bay, Strait of Juan de Fuca, and in the Pacific Ocean off the village of Neah Bay, and more recently a very large number of boats have been trolling off the mouth of the Columbia River. With the exception of fishermen from a few towns in Pacific County, however, the latter fishery was of no great importance in 1915. In 1916, while no statistics are available, it was reliably reported that as many as 1,500 boats from Washington and Oregon were engaged in trolling off the Columbia River; some of these were sport fishermen, but the greater proportion were engaged in commercial fishing. Some of the boats were from as far up the river as Vancouver. Many of the gill-net fishermen laid aside their nets to troll.

In 1915 nearly 500 boats were engaged at times in trolling in the vicinity of Neah Bay. As in halibut fishing, it is followed on banks, very little being done in deep water. The boats alternate between fishing in Neah Bay and in the ocean, according to the run of fish. If the weather is favorable and fishing good, a boat may remain out in the ocean, but this condition is said to have been reversed in 1916. The greatest distance resorted to by trollers is off Swiftsure Lightship, 15 miles WNW. from Tatoosh Island. More trolling was done on this than on any other ocean bank in 1915.

The season for trolling is usually from June 15 to September 15, and often continues until the last of October or later; but the fall gales usually put an end to the fishing, as the boats are too small to weather heavy seas.

The catch consists almost entirely of chinook and silver salmon. The former species usually predominates, but in 1915 silver salmon were much more plentiful. In 1915 probably three-fifths of the catch was sold to a nearby cannery and the remainder to buyers representing wholesale dealers in Seattle and a few in Tacoma. The fish are delivered to the canneries by means of "tenders." The tenders are gasoline boats, each of which tows a large scow. The gasoline boat loads first and makes the trip to the cannery while the scow is being loaded. The scow is usually anchored in Neah Bay. The fish are sold in the round by the fishermen. When sold to a nearby cannery the fish are not dressed until landed at the cannery; when sold to distant canneries they are dressed on the cannery scows as they are brought in. In 1916 a canning firm at Anacortes had a scow anchored in Neah Bay fitted up with an "iron chink," or dress-

ing machine, which eviscerates and cuts off the head, fins, and tail of the fish.

When fishing on the outside in the ocean fishermen leave the village of Neah Bay or vicinity at about 1 a. m. and reach the fishing grounds at 4 o'clock. The best trolling is supposed to be at daylight. Fishing is usually continued until dark; if intending to remain the boat is anchored on the bank overnight, and fishing is resumed the next morning and continued until noon of the following day, when a return is made to Neah Bay for the night. Another trip is made to the fishing grounds on the following morning. These return trips to Neah Bay are often necessitated by the failure of the tender to get out to the fishing grounds.

The boats used for trolling are of gasoline power, and, with few exceptions, are less than 5 net tons in size and very seldom have more than one man aboard. A considerable number of rowboats, however, are also used in the fishery. It is a common occurrence for a gasoline boat to have two rowboats in tow while trolling, and occasionally as many as four may be under tow. When the two rowboats are being towed each will be off the quarter of the gas boat and about 200 feet behind it. In the case of four rowboats the second two boats are at a distance of about 600 feet behind the gasoline boat. The distance between the boats is so arranged that the lines will not interfere with each other. The common practice is for the owner of the rowboat to give one-third of his catch to the owner of the gas boat for being towed. It is said that rowboat fishing is often as successful as that from the gas boat.

Gas boats usually have three lines fishing at a time—one from each quarter of the boat and the other attached to a pole 6 feet long, placed upright near the center of the boat and running off from the stern. The side lines are worked from outriggers 10 feet long, projecting out from the side of the boat. No bait, but a spoon is always used. Until recent years two and sometimes three hooks were used, but now the common practice is to use only one hook.

Pound nets.—Based upon the value of the catch, pound nets ranked second in importance among the forms of fishery apparatus used in Washington in 1915. The catch for that year amounted to 37,560,330 pounds, valued at $991,115, an increase of 10,102,969 pounds and $130,818 since 1904. There were 444 pound nets, costing $1,100,103, operated in the State in 1915. It is customary among the owners of pound nets in Washington to include in the value of the pound net the estimated value of the "stand," or bottom, where the net is set, but that practice has not been followed in this report. It is no doubt true that in most cases considerable value does attach to the stand, which is proved by the fact that even though a pound net is not to be fished a license is nevertheless secured from the State simply to hold the stand, for which large sums have often been offered. Pound nets are quite generally used throughout the Puget Sound region and also in the Columbia River as far up as commercial fishing is followed. The nets used in the Puget Sound region are much larger and more expensive than those used in the Columbia River and are commonly owned by corporations, while those in the latter stream are owned mostly by individuals. The name "trap" is always used for pound nets in this region.

Pound nets used in Washington waters are similar in principle to those used on the Atlantic coast, consisting of a leader, one and very often two hearts, a large followed by a small one, and a tunnel leading into the pot. In addition, however, what is known as a "spiller" is attached to the side of the pot. A tunnel leads from the pot into the spiller, the fish being removed from the latter, the same as from the pot, where there is no spiller. As a rule in Puget Sound wire is commonly used for the leaders and hearts and cotton twine for the pot and spiller. Occasionally wire is also used for the pot, but never in the spiller, as it could not then be fished. Wire has come into use within recent years. It is fastened to the top of the stakes by the use of boards. In addition to the two hearts some pound nets have what are termed "jiggers" attached to the inside of the first or large heart. These are in reality equivalent to another and larger heart. The netting of the pot very seldom extends to the bottom, as this would mean an unnecessary expenditure, but instead an "apron" of netting leading up from the heart to the bottom of the pot is used to lead the fish into the pot. Some pound nets are set to fish only one side, the location rendering the other side useless for fishing.

The pound nets in Willapa Harbor are quite small as compared with those in Puget Sound. The leaders are usually 100 feet or less in length, and only one heart is used. A wing is used from one side of the heart to draw the fish into it. In order to use all available space, the tunnel from the heart to the pot opens out from the side instead of the end of the heart. The tunnel is about 3 feet wide at the large end and narrows down to 18 inches at the small end. The tunnel from the pot to the spiller is still smaller; but even as small as these entrances are, it is said that seals sometimes succeed in getting into the pot and sometimes even into the spiller. All parts of these nets are made of twine.

Pound nets, as previously stated, are fished in the Columbia River on the Washington side as far up as commercial fishing is followed; but more are set off Chinook than from all other points on the river combined. The total number operated in 1915 in the vicinity of that town was 118, having a value of $97,700. These nets, as the value indicates, are much smaller than those used in Puget Sound and are set in water from 15 to 25 feet deep. The leaders range in length from 100 to 900 feet. One heart only is used; this has an average length of from 30 to 35 feet and a width of 40 feet. The pots range in size from 32 to 36 feet square and the spiller from 16 to 24 feet square. The entire net is made of twine, no wire, as in Puget Sound, being used. In places where the current is very strong, the entrance from the heart to the pot is similar to those of nets in Willapa Harbor; that is, from the side of the heart. In this case the pot and spiller are upstream from the heart.

The pound nets used farther up the Columbia River at Kalama are like those below, except that they have no spiller, the catch being taken direct from the pot. The leaders vary in length from 150 to 600 feet, and the pots are usually about 24 feet square.

The pound-net season on the Columbia River is from May 1 to August 25, and from September 10 to March 1, but only a few continue fishing after the first of December. During the spring and summer season, fishing is prohibited from 6 p. m. on Saturdays to 6 p. m. on Sundays. The pound-net stakes are allowed to remain down

during the entire year below Altoona, while above that town the Government requires that the stakes be removed after fishing ceases, except during the interval between the summer and fall fishing.

The nets are often set on sand bars, and the pots, in many cases, are out of water at extreme low tide.

Seines.—The total catch with seines in Washington in 1915 amounted to 39,332,569 pounds, having a value to the fishermen of $734,154, as compared with 19,814,215 pounds, valued at $427,896, taken in 1904. The seine catch now ranks third in value among the different forms of apparatus. In 1904 the entire catch was made in the shore fisheries, while in 1915 nearly 90 per cent of the catch was made by vessels of 5 tons and over. Haul seines are used mostly in the shore fisheries, while with few exceptions purse seines are used on vessels; this illustrates the advance made in this fishery. Purse seines are used chiefly in the Puget Sound region, less than a half dozen being operated in the Columbia River. Occasionally purse-seine vessels work outside of the 3-mile limit, and even as far as 15 miles off Cape Flattery; but one objection to this offshore fishing is that the salmon taken there on their way to their spawning ground are quite fat. Unless they are cleaned and prepared for canning at once they are unfit for use when taken ashore. This drawback has in a measure been overcome, as in trolling, by one cannery anchoring a scow provided with an "iron chink" on the fishing grounds near Cape Flattery for cleaning the salmon as soon as delivered. In most cases the catch of purse-seine vessels is delivered to buy boats owned by the several salmon canneries, which come direct to the fishing grounds for the fish.

The purse-seine season has until recently always begun about July 1 with fishing for bluebacks or sockeyes. Within the past few years, however, a few of the larger vessels have been fishing for silver salmon some distance off Cape Flattery from about June 10 to the middle of July. In 1916 this work was prosecuted until the latter part of August. Very little purse seining is done during January, February, and March, or in fact, until June or July, when the new season begins. Various sections of Puget Sound are closed to purse seines during certain periods of the year, and the entire sound and its tributaries are closed to all fishing, except with hook and line, from March 1 to April 15, both dates inclusive.

Purse seines in Washington are restricted in length by law to 1,800 lineal feet, measured on cork line when wet. Most of the fishermen aim to have their seines up to the legal limit. The depth averages about 400 meshes of 3¾ inches, 9 or 12 thread cotton twine, with 50 meshes of 5 inch, 15 or 18 thread cotton twine on the bottom. The bunt is from 60 to 75 feet long, and 200 meshes of 3-inch 18-thread cotton twine deep. The crew on a purse-seine vessel ranges from five to eight men, a majority of the vessels having seven men. The custom is for the owner of the vessel to furnish the boat, seine, dishes, and everything except the food. The vessel is allotted four shares, and the members of the crew one share each. In a crew of seven men, including the owner, there would be 11 shares; that is, the boat would draw four shares, and the remaining seven shares would be divided among the owner and six men. Of course, when the owner does not work he gets no share except the vessel's four shares. The cook does only light work, but helps in fishing and draws

one share. Where the food is bought at the beginning of the season each man pays his share, or is charged with it. With a crew of seven men, each member of the crew would pay one-eleventh of the cost of food. The first purse seining in Washington is said to have been in 1894 or 1895.

Gill nets.—Gill nets are of two kinds, drift and set, and are more generally used in the fisheries of Washington than any other form of fishing apparatus. The total catch with gill nets in 1915 amounted to 13,599,830 pounds, valued at $453,864, as compared with 21,013,582 pounds, valued at $632,810, in 1904, showing a decided decline with this apparatus. In 1915, 19,760 pounds, valued at $446, were taken in the vessel fisheries, and about the same quantity in 1904. The products consisted mainly of the different species of salmon. Gill nets are fished in most of the tide-water streams of the State. The most prolific of these is, of course, the Columbia River. Another very important stream is the Quinault River, running through the Indian reservation of the same name. In 1915 a catch of more than one and a quarter million pounds of salmon was made in this stream by the Indians living on the reservation. These Indians are very industrious and took advantage of one of the best salmon runs recorded on the river. More than 90 per cent of the catch consisted of bluebacks, or sockeyes, which were used by the canneries at Aberdeen and Hoquiam. Drift gill nets are used much more extensively than set gill nets.

A description of drift gill nets used in the vicinity of Seattle will answer in most particulars for those used at other localities in the State.

These nets are almost invariably of No. 40 linen twine, which for chinook salmon is 9-ply, for bluebacks 6-ply, and for silver and chum salmon 7-ply. No special nets are used for humpbacks and steelheads. The following sizes of mesh are used: For chinook, 6½ to 8-inch; for sockeye, 5¾-inch; for silver, 6 to 6¾-inch; for chum, 6 to 6¾-inch. Steelhead are usually caught in a 6¾ to 7-inch mesh. About the only nets of cotton twine used are those fished for salmon trout, another name for small salmon up to 2 pounds in weight; but even for this purpose the linen twine is preferable. It is customary for a fisherman to have a different gill net for each species of salmon except steelhead and humpback. The length of the nets varies from 40 to 450 fathoms; the majority of the nets being from 150 to 200 fathoms long. The shorter nets are used from rowboats and are set mostly in the Duwamish River. The longer nets are used from the gasoline boats and are fished in Puget Sound and other waters as far north as the Gulf of Georgia near Blaine and Point Roberts. The fishermen usually go to the more distant waters for bluebacks; for silver salmon they fish near Everett and San Juan Islands. The chum salmon are taken near Seattle and Rollingbay, as are also the chinooks. The depth of the nets ranges from 30 to 50 meshes. About one-half of the boats used for drift gill netting at Seattle are gasoline with an average value of $600. The other half are row skiffs worth $25 each. From one to two men go in a gasoline boat, but only one man goes in a skiff. The nets were formerly set at an angle, but the practice now is to set them in a straight line.

The fishermen at Everett use these drift gill nets in the Snohomish River. Only rowboats are used on the stream. The nets average

about 90 yards in length and 25 meshes (6½ inches) in depth. Silver salmon predominate in the catch.

Drift gill netting is usually followed at night, as the water is too clear, except after a freshet, to fish during the day.

An extensive drift gill-net fishery is prosecuted from La Conner, Skagit County, in the north fork of the Skagit River. A few boats from this vicinity also go as far north as the Gulf of Georgia. Most of the fishing in these waters, as well as in the Strait of Juan de Fuca, is done during the summer, and mostly for bluebacks, though humpbacks are also taken at the same time. Silver salmon are taken more in the tributary streams. In 1915 the spring and summer catch from the Skagit River was utilized by the fresh-fish markets, but the fall catch was delivered to the canneries. In 1916 practically the entire catch, with the exception of steelhead, was utilized by the canneries.

The drift gill-net fishermen at towns on Grays Harbor are divided between those fishing on the Chehalis and those fishing on the Columbia Rivers; the former using row, and the latter gasoline, boats. The nets used on the Chehalis River average 100 yards in length and 35 meshes of 6¾ inches in depth. Chinook, silver, and chum salmon in the order of their importance were taken. A few men use nets with 8¼-inch mesh for the larger chinook salmon.

The distance a net is allowed to drift before being lifted is termed a "drift" or "reach." On this river it is from 500 to 1,000 feet, depending upon the condition of the bottom as to snags or other obstructions. In 1915, the catch was sold mostly to near-by canneries, but conditions were somewhat changed in 1916.

Drift gill nets used on the Columbia River in Washington vary in length from 450 to 500 yards, used at Ilwaco at the mouth of the river, to 250 yards at Stevenson, the most distant point up the river at which they are used. At Vancouver and vicinity, however, the nets average about 600 yards in length. The depth of the net varies from 25 to 30 feet. This applies only to surface drift nets; diver or bottom nets will be described later. No. 40 linen twine running from 7 to 14 ply is almost invariably used. With few exceptions, two men are required to fish a net. None but gasoline boats are used. The fishing is ordinarily followed at night, but when the water becomes roily it can be done during the day. A "drift" or "reach" varies according to the locality and conditions. A net is sometimes allowed to drift a mile before lifting. During the spring the State law prohibits fishing from 6 p. m. Saturday until 6 p. m. Sunday. Gill nets are washed about every week in a solution of bluestone and water to remove the slime. It is a common practice to tan the nets at intervals to render them less discernible in the water. The drift gill nets just described are all surface nets. Above Altoona a net known as a "diver," or submersible drift gill net, is used. The diver is similar to the surface net except that the corks are smaller and the cork and lead lines lighter, so that it will just touch the bottom. The nets are also shorter and much more shallow than the surface nets. The number in use increases going up the river from Altoona, and above Kalama it is the only kind used. Those used at Kalama and above are, however, different from those below. Instead of one they have three webs, similar to a trammel net, except that the salmon are gilled and not pocketed. The three webs are suspended

from a common cork line, but there are two lead lines. The back webbing is usually from 3 to 5 feet deeper than the other two. The two front nets hang together from the cork line to the front lead line. The back, or main, net hangs from the cork line to the other lead line. The first and third nets commonly have a mesh of 8 inches and 7 inches, respectively, while the middle net has a mesh of 10 or 11 inches. The front net is called the "apron." Several reasons are assigned for using diver gill nets. One is that they are sunk to avoid driftwood or other refuse on the surface, especially during the spring freshets. Another reason is that the fish, having encountered so many surface gill nets and pound nets in the river below, become more timid and swim lower. Diver nets float much more slowly than surface nets. It is always necessary to clean the bottom of the river before setting diver nets.

The most profitable drift netting is followed from the first of May until the latter part of August. Some fishing is also followed in the fall, but it is not so profitable then, as the run consists mainly of "tuties" or fall chinooks, which sell for a very low price and are scarcely worth handling.

Set gill nets.—Set gill nets are much shorter than drift gill nets and are fished in small streams or inlets. The two extremes of length would probably be 6 and 100 yards, but a fair average might be about 15 yards. Their depth ranges from 30 to 50 meshes, the number varying the same as in the drift net. Linen twine of the same kind and size, as for drift nets is used. It is almost a universal custom to set them in eddies, one end being tied to a stake, or some stationary object, and the other anchored. Sometimes they are buoyed or anchored at each end. They can not be set across a navigable stream, as they would interfere with navigation. One man is sufficient to handle one or more set nets, a rowboat being commonly used. The extent of the set gill-net fishery is small as compared with drift gill netting. Silver, chinook, steelhead, and chum salmon, in the order of their importance, are the principal species taken.

Harpoons.—Harpoons are used only in the whale fishery, which is centered mainly in Pacific County. One coast-trading steamer owned in Seattle also followed whaling incidentally for a short time. The harpoon gun used in the whale fishery is, in reality, a small cannon placed on a raised platform on the forward part of the boat. The bomb, a sharp-pointed projectile about a foot long, is screwed onto the tip of the harpoon. The stem or handle of the harpoon is sometimes one solid piece, but more often two pieces united at the end. The advantage of the latter kind is that it is light and can be sent a greater distance. The head of the harpoon consists of four flukes or barbs which are lashed together by spun yarn. The harpoon, with bomb attached, is about 5 feet long. When the harpoon enters the whale, the spun yarn is shoved off the flukes, allowing the latter to open in the body of the whale. At the same time, as soon as the bomb enters the whale, it is exploded into many pieces. There is usually an interval of two seconds after firing before the bomb explodes, this interval depending upon how hard the powder is packed in the bomb. The ignition of the powder in the bomb follows the shoving off of the spun yarn from the flukes of the harpoon, the latter operation pulling a wire connecting with a fuse cap in the bomb. In some instances, but not in this case, an igniter

fastened to the sight of the gun connects with the powder in the bomb, the act of firing exploding the bomb. One pound of ordinary gunpowder is required for the gun and the same amount for loading the bomb. The harpoon is loaded into the gun to the lower or unattached ends of the flukes. The gun, of course, loads from the muzzle. Each steamer carries one gun.

A harpoon can be fired with accuracy a distance of 50 yards. One shot is sometimes sufficient; if a vital spot is reached, the whale is killed instantly. Sometimes it is necessary to shoot twice with a harpoon similar to the one above, and occasionally for the second or third shot a harpoon without flukes, or a "shooting lance," as it is called, is used. A line 4 inches in circumference and from 25 to 40 fathoms long, called the "foregoer," is attached to the end of the harpoon and in turn is spliced to the main line, 6 inches in circumference and 360 fathoms long. The latter line reels out over a winch on the forward part of the boat as the whale tries to escape. It is sometimes necessary to play the whale five or six hours, and occasionally it is necessary to fire three harpoons into it before it is captured. The harpoons are usually extracted from the whale, straightened, and used again. The whale is towed to land as soon as killed, but should there be several in sight an effort is made to get the others before taking any ashore. A proficient gunner on a whale steamer commands good wages.

Hoop nets and pots.—Hoop nets, or "ring nets," as they are commonly called, and pots are used exclusively in catching crabs. The output with hoop nets far exceeds that with pots. A hoop net consists of two hoops, one 3 feet and the other or lower one 2½ feet in diameter, placed 14 inches apart and connected with netting, netting also being around the bottom of the lower hoop to hold the crabs. The net, of course, collapses when set on the bottom. Bait consisting of clams is placed in a small knit bag tied to one of the hoops. The most important points in the State where hoop nets are used are Bay Center, Tokeland, and South Bend, in Pacific County, and Westport, in Grays Harbor County.

Pots are more generally used at Utsaladdy and Dungeness, in Island and Clallam Counties, respectively. While hoop nets are sometimes set on the inside of Grays Harbor and Willapa Harbor, it is the general practice to set them in the Pacific Ocean a few hundred yards from shore. Occasionally a fisherman will set his nets 2 or 3 miles from shore, but the best catches are made just outside the breakers.

It is usually necessary to cross a bar in going to and from the fishing grounds in the ocean, and this fact makes it one of the most hazardous of the State's fisheries. This, together with unfavorable weather conditions, reduces the number of trips possible for a boat. The nets are generally set in strings of 20 to 30, placed 200 to 300 feet apart and in from 5 to 8 fathoms of water. If the crabs are plentiful, the nets are fished continuously; this would mean an interval of about an hour in fishing the same net. Each net is located by means of a buoy; sometimes two, but more often one man goes to a boat.

The pots used in catching crabs vary in style, but their general appearance is somewhat similar to the eastern lobster pot, except for having a flat top. They vary from 3 to 4 feet in length, 15 to 30 inches in width, and 14 to 20 inches in height, and have a funnel

at each end. Some have wooden and others an iron frame. Some are inclosed with wire netting and others with slats made of laths. Those with wooden frames are anchored with bricks, while those with iron frames need nothing to sink them. The pots are baited with grayfish, sharks, or other cheap fish and clams. The crab fishery is followed in the fall, winter, and spring.

Beam trawls.—The total catch with beam trawls in 1915 amounted to 434,313 pounds, valued at $20,191, of which 290,935 pounds, valued at $14,154, were taken in the vessel and the remainder in the shore fisheries. With the exception of 47,893 pounds of mixed fish, mainly sole, valued at $1,472, the catch consisted entirely of shrimp. The beam trawls used for fish are similar to those used in taking shrimp, except that they are much smaller. The present style of beam trawl for shrimp came into use in 1913. It consists of a wooden beam of 6-inch scantling, 20 to 25 feet long, to each end of which is fastened an iron runner. The beam sets about 3 feet, or the height of the runners, above the ground. A bag 20 to 30 feet long, of 1-inch mesh for shrimp, and 4-inch mesh for groundfish, is fastened to the beam and sides of the runners. There is a slack in the lower part of the mouth of the bag. A bridle extends a few feet in front of the runners, and to this bridle is attached a cable fastened at the other end to the boat.

The shrimp trawl in use for many years before the introduction of the present style consisted of a frame of 1¼-inch iron working over the bottom on two shoes, one on each side. The mouth of the bag was fastened to the upper and lower parts of the frame.

The vessels engaged in beam trawling ranged in size from 5 to 27 net tons; nearly one-half of them were steamers, and the remainder were operated by gasoline. The crew usually consisted of two men. The fishing is followed in from 18 to 35 fathoms of water. Shrimp can be taken from April 1 to December 31, but the best catches are made in November and December.

Dip nets.—The use of dip nets is restricted exclusively to taking eulachon or candlefish, which are tabulated as smelts. This fishery is confined mostly to Kelso and vicinity, in Cowlitz County. The total catch with dip nets in 1915 amounted to 1,619,500 pounds, valued at $6,695, all taken in the shore fisheries.

Reef nets.—Reef nets were used only in the shore fisheries, the total catch in 1915 amounting to 170,207 pounds, valued at $4,199. The catch consisted of several species of salmon. Reef nets are fished only in San Juan and Whatcom Counties, and mostly by Indians. As the name indicates, they are always set on reefs. They are made entirely of netting, have a leader, and are similar in appearance to a small pound net without a heart, but are less substantially constructed. The reef acts as a leader in addition to the one of netting. At the outer end of the latter is a pound or pot having four sides into which the fish lead. The front or inshore side of this pot is dropped down when the net is fishing to allow the fish to enter. When the Indians see the fish moving in considerable quantities toward the pot, they yell and make as much noise as possible to frighten them into entering it, after which they pull up the front part to prevent their escape. It usually requires six men in two canoes to fish a net. A canoe is stationed on each side of the pot, the men in each holding a line con-

nected with the front of the pot. As soon as the fish have entered, the men pull the front up with these lines. The bottom of the pound is then lifted so that the fish can be removed with dip nets.

Wheels.—Wheels are of two kinds, movable and stationary. Two of the latter kind were fished in the Columbia River off Pacific County. The catch was unimportant, amounting in 1915 to only 5,234 pounds, with a value of $211.

Dredges, tongs, rakes, hoes, etc.—The dredge is the only one of these apparatus used both in the vessel and shore fisheries. Out of a total catch of 1,740,609 pounds, valued at $468,006, 1,227,315 pounds, valued at $433,985, were taken inshore, and the remainder in the vessel fisheries. Compared with the catch by the same apparatus in 1904, there was a decrease of 525,920 pounds and an increase of $2,132. The loss of weight was mainly in native oysters.

Dredges are used exclusively in taking oysters and are similar to those used in the east for this purpose. Tongs, rakes, and hoes are also used for taking oysters. Both hoes and forks are used in catching hard clams, but shovels only are used for razor clams. The few mussels shown were taken with the oysters.

Yield of the Vessel Fisheries of Washington in 1915, by Counties, Species, and Apparatus.

Apparatus and species.	Grays Harbor.		Island.		Jefferson.		King.		Kitsap.		Pacific.		Pierce.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Seines:														
Herring							337,450	$1,567	1,302,951	$5,536			45,000	$200
Salmon—														
Blueback or sockeye			5,800	$444	1,140	$100	352,265	31,168	156,560	13,300			283,795	24,529
Chinook			278	9	8,000	280	81,555	2,654	87,935	2,859			104,099	3,121
Chum			43,224	703	38,936	633	3,665,604	78,357	1,700,970	27,607			3,419,920	55,526
Humpback			74,828	922	19,224	240	5,284,916	59,361	2,007,612	22,449			4,353,636	51,760
Silver			11,154	409	3,726	137	835,153	32,478	274,038	10,964			666,612	25,623
Smelt							16,998	522	8,288	295				
Steelhead trout					25	2	1,976	113	557	37			235	16
Sturgeon							200	12						
Total			135,284	2,487	71,051	1,392	10,576,117	206,232	5,538,911	83,047			8,873,297	160,775
Gill nets:														
Cod							15,000	265						
"Lingcod"							160	6						
Total							15,160	271						
Beam trawl:														
Cod							225	7						
Flounders							555	7						
Perch							50	3						
Rockfishes							201	11						
Sole							6,562	214						
Shrimp							44,450	3,050					139,432	6,386
Total							52,043	3,292					139,432	6,386
Hoop nets and pots: Crabs							1,450	54			6,600	$200	22,661	850
Lines:														
Cod, salted							2,220,000	73,980						
Halibut	413,000	$21,607			31,000	1,700	33,627,389	1,690,566	2,401,956	120,754			4,003,260	201,257
"Lingcod"							21,400	625						
Rockfishes	18,000	448					4,900	119						
Sablefish							526,810	12,557	27,000	675			21,000	525
Salmon—														
Chinook	15,000	740					23,400	925	3,000	75			2,000	50
Humpback							455	5						
Silver	7,000	140					45,500	925	6,500	175			10,000	200
Cod tongues							12,000	836						
Total	453,000	22,935			31,000	1,700	36,481,854	1,780,538	2,438,456	121,679			4,036,260	202,032

YIELD OF THE VESSEL FISHERIES OF WASHINGTON IN 1915, BY COUNTIES, SPECIES, AND APPARATUS—Continued.

Apparatus and species.	Grays Harbor.		Island.		Jefferson.		King.		Kitsap.		Pacific.		Pierce.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Dredges, etc.:														
Eastern oysters, market											43,519	$23,155		
Native oysters, market											175	75		
Total											43,694	23,230		
Harpoons:														
Whalebone							6,000	$4,200						
Whale oil	2,575,125	$110,051					60,000	2,800						
Other whale products	1,292,000	24,390												
Total	3,867,125	134,441					66,000	7,000						
Grand total	4,320,125	157,376	135,284	$2,487	102,051	$3,092	47,192,624	1,997,387	7,977,367	$204,726	50,294	23,430	13,071,650	$370,043

Apparatus and species.	San Juan.		Skagit.		Snohomish.		Thurston.		Wahkiakum.		Whatcom.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Seines:														
Herring					275,000	$1,169					20,000	$85	1,980,401	$8,557
Salmon—														
Blueback or sockeye	25,425	$2,288	55,585	$4,446	70,670	5,653					258,790	23,230	1,210,030	105,158
Chinook	2,676	83	65,686	2,299	60,704	2,125			62,500	$1,560	43,968	1,548	517,401	16,538
Chum	103,912	1,688	540,000	12,125	398,904	7,479			24,000	120	1,695,648	27,199	11,631,118	211,437
Humpback	459,300	5,739	762,800	11,442	1,080,048	16,200					3,180,264	36,148	17,222,628	204,261
Silver	60,174	2,381	121,800	5,075	161,460	6,727			20,000	400	492,174	18,335	2,646,291	102,529
Shad			423	13									423	13
Smelt	1,000	35			1,406	50	47,488	$1,665					75,180	2,567
Steelhead trout	50	2	13,787	824	75	4			2,500	80	475	32	19,680	1,110
Sturgeon													200	12
Total	652,537	12,216	1,560,081	36,224	2,048,267	39,407	47,488	1,665	109,000	2,160	5,691,319	106,577	35,303,352	652,182
Gill nets:														
Cod													15,000	265
"Lingcod"													160	6
Salmon—														
Blueback					750	60							750	60
Chinook					250	10							250	10
Chum					400	7							400	7

Humpback					1,200	18							1,200	18
Silver					2,000	80							2,000	80
Total					4,600	175							19,760	446
Beam trawl:														
Cod													225	7
Flounders													555	7
Perch													50	3
Rockfishes													201	11
Sole													6,562	214
Shrimp							99,460	4,476					283,342	13,912
Total							99,460	4,476					290,935	14,154
Hoop nets and pots: Crabs											61,520	2,000	92,231	3,104
Lines:														
Cod, salted			3,278,284	106,954									5,498,284	180,934
Halibut					45,000	1,890							40,521,605	2,037,744
"Lingcod"													21,400	625
Rockfishes													22,900	567
Sablefish					1,000	25							575,810	13,782
Salmon—														
Chinook					4,600	200							48,000	1,990
Humpback													455	5
Silver					9,000	275							78,000	1,715
Cod tongues			18,000	1,254									30,000	2,090
Total			3,296,284	108,208	59,600	2,360							46,796,454	2,239,452
Dredges, etc.:														
Eastern oysters, market			16,800	9,000									60,319	32,155
Native oysters, market			2,800	1,600									2,975	1,675
Kelp	450,000	191											450,000	191
Total	450,000	191	19,600	10,600									513,294	34,021
Harpoons:														
Whalebone													6,000	4,200
Whale oil													2,635,125	112,851
Other whale products													1,292,000	24,390
Total													3,933,125	141,441
Grand total	1,102,537	12,407	4,875,965	155,032	2,112,467	41,942	146,948	6,141	109,000	2,160	5,752,839	108,577	86,949,151	3,084,800

STATISTICS OF THE YIELD OF THE SHORE FISHERIES OF WASHINGTON IN 1915, BY COUNTIES, SPECIES, AND APPARATUS.

BY SEINES.

Species.	Asotin.		Clallam.		Clarke.		Columbia.		Cowlitz.		Franklin.	
	Lbs.	*Value.*	*Lbs.*	*Value.*	*Lbs.*	*Value.*	*Lbs.*	*Value.*	*Lbs.*	*Value.*	*Lbs.*	*Value.*
Carp					200,000	$4,000						
Salmon:												
Blueback or sockeye	1,100	$88							100	$5		
Chinook	17,130	1,370	29,590	$740			10,125	$759	172,500	4,140	2,490	$199
Chum			21,386	371					5,400	27	984	79
Silver	1,080	86	61,530	1,168							680	54
Shad									10,600	208		
Steelhead trout	61,088	4,887					9,600	720	5,817	174		
Total	80,398	6,431	112,506	2,279	200,000	4,000	19,725	1,479	194,417	4,554	4,154	332

Species.	Garfield.		Island.		Jefferson.		King.		Kitsap.		Mason.	
	Lbs.	*Value.*	*Lbs.*	*Value.*	*Lbs.*	*Value.*	*Lbs.*	*Value.*	*Lbs.*	*Value.*	*Lbs.*	*Value.*
Cod									1,800	$35		
Flounders					6,000	$120	500	$12	13,000	375		
Grayfish			280,000	$629	220,000	494			450,000	1,017		
Herring					10,700	80	103,750	497	32,098	499		
"Lingcod"									1,000	25		
Perch			500	15	500	15	2,100	90			1,000	$40
Rockfishes					4,000	240	2,300	135	2,800	160		
Salmon:												
Blueback or sockeye	2,250	$180					15,505	1,345				
Chinook	14,640	1,170	11,050	396	250	8	3,650	127	3,485	140	1,100	66
Chum			6,800	14	5,600	75	150,400	3,284	8,532	185	19,720	125
Humpback			1,400	18			224,196	2,521	1,112	23	32	1
Silver			3,450	138	3,650	150	33,222	1,258	2,953	118	20,250	743
Sharks			18,000	41	14,000	32			10,000	22		
Skates			12,000	27	8,000	18			8,000	18		
Smelt			71,500	2,543	7,300	355	26,003	887	85,201	3,063	62,300	2,180
Sole			500	20	1,000	30	4,000	137	19,400	532		
Steelhead trout	10,136	811	158	10			825	66	25	2		
Total	27,026	2,161	405,358	3,851	281,000	1,617	566,451	10,359	639,406	6,214	104,402	3,155

Species.	Pacific.		Pierce.		San Juan.		Skagit.		Snohomish.	
	Lbs.	*Value.*	*Lbs.*	*Value.*	*Lbs.*	*Value.*	*Lbs.*	*Value.*	*Lbs.*	*Value.*
Flounders			2,000	$20						
Grayfish			250,000	562	60,000	$135				
Perch			1,200	36						
Salmon:										
Blueback or sockeye	29,850	$597					9,500	$850		
Chinook	153,675	9,220	3,075	122			1,870	70	225	$8
Chum			20,480	139			92,000	1,700		
Humpback			2,432	59	28,000	$420	131,200	1,500	6,500	100
Silver			8,824	306			16,100	625	25	1
Shad	12,959	130								
Sharks			10,000	22	2,000	5				
Skates			8,000	18	2,000	4				
Smelt			25,200	855	1,076	39	43,591	1,313		
Steelhead trout	49,225	1,723					750	45		
Sturgeon	2,600	156								
Caviar	150	38								
Total	248,459	11,864	331,211	2,139	93,076	603	295,011	6,103	6,750	109

STATISTICS OF THE YIELD OF THE SHORE FISHERIES OF WASHINGTON IN 1915, BY COUNTIES SPECIES, AND APPARATUS—Continued.

BY SEINES—Continued.

Species.	Thurston.		Wahkiakum.		Whatcom.		Whitman.		Total.	
	Lbs.	*Value.*	*Lbs.*	*Value.*	*Lbs.*	*Value.*	*Lbs.*	*Value.*	*Lbs.*	*Value.*
Carp									200,000	$4,000
Cod									1,800	35
Flounders									21,500	527
Grayfish									1,260,000	2,837
Herring									146,548	1,076
"Lingcod"									1,000	25
Perch									5,300	196
Rockfishes									9,100	535
Salmon:										
Blueback or sockeye	4,980	$440	15,530	$776	5,500	$495	1,250	$87	85,565	4,863
Chinook			94,250	5,655	960	30	2,848	199	522,913	24,419
Chum					32,000	520			363,302	6,519
Humpback	26,304	395			68,000	650			489,176	5,687
Silver	1,878	70			10,800	375	3,688	258	168,130	5,350
Shad			26,828	268					50,387	606
Starks									54,000	122
Skates									38,000	85
Smelt	74,500	2,610			38,430	1,367			435,101	15,212
Sole									24,900	719
Steelhead trout			8,037	240			3,984	279	149,645	8,957
Sturgeon							100	8	2,700	164
Caviar									150	38
Total	107,662	3,515	144,645	6,939	155,690	3,437	11,870	831	4,029,217	81,972

BY GILL NETS.

Species.	Asotin.		Clallam.		Clarke.		Cowlitz.		Grays Harbor.		Jefferson.	
	Lbs.	*Value.*	*Lbs.*	*Value.*	*Lbs.*	*Value.*	*Lbs.*	*Value.*	*Lbs.*	*Value.*	*Lbs.*	*Value.*
"Lingcod"											300	$7
Perch											5,000	125
Rockfishes											1,000	60
Salmon:												
Blueback or sockeye					7,710	$384	9,780	$452	1,242,530	$57,353		
Chinook	30	$2	78,960	$1,976	510,200	30,611	852,125	19,346	498,170	9,938	20	1
Chum			13,490	165	7,900	39	51,200	256	973,962	4,480	4,600	57
Humpback			38,400	1,200			240	3	18,420	231		
Silver			80,148	1,687	6,100	142	21,520	499	727,430	13,957	6,720	193
Shad					19,550	197	8,600	85				
Smelt					50	1	6,000	50				
Steelhead trout	1,040	84			42,412	1,277	119,712	4,117	82,850	4,364	3,560	20
Sturgeon					2,500	130	6,400	320	240	7		
Total	1,070	86	210,998	5,028	596,422	32,781	1,075,577	25,128	3,543,602	90,330	21,200	463

Species.	King.		Kitsap.		Klickitat.		Lewis.		Mason.		Pacific.	
	Lbs.	*Value.*	*Lbs.*	*Value.*	*Lbs.*	*Value.*	*Lbs.*	*Value.*	*Lbs.*	*Value.*	*Lbs.*	*Value.*
Cod			4,700	$105								
Flounders			600	18								
Perch			1,900	94								
Salmon:												
Blueback or sockeye	88,550	$7,080	9,385	734	90	$5	75	$7			4,240	$332
Chinook	138,420	5,553	3,518	132	2,375	163	7,930	418	3,648	$220	1,231,220	57,806
Chum	252,080	3,780	10,178	215			385	5	3,120	28	226,889	1,110
Humpback	62,480	469	3,376	53							400	5
Silver	258,424	9,927	20,073	817			2,710	77	4,800	175	149,779	2,997
Shad											47	1
Smelt			686	23								
Sole			200	6								
Steelhead trout	70,325	5,605	1,545	117	2,337	165	471	35	1,875	125	33,642	1,288
Sturgeon											11,800	518
Caviar											150	37
Total	870,279	32,414	56,161	2,314	4,802	333	11,571	542	13,443	548	1,658,167	64,094

STATISTICS OF THE YIELD OF THE SHORE FISHERIES OF WASHINGTON IN 1915, BY COUNTIES, SPECIES, AND APPARATUS—Continued.

BY GILL NETS—Continued.

Species.	Pierce.		San Juan.		Skagit.		Skamania.		Snohomish.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Perch	2,500	$75								
Salmon:										
Blueback or sockeye	7,750	622	10,565	$950	12,435	$560	7,755	$386	9,250	$740
Chinook	14,640	923	549	14	444,398	20,398	95,375	4,384	75,790	2,654
Chum	48,170	301	7,840	127	824,800	15,044	8,750	43	101,414	1,912
Humpback	38,488	962	120,288	1,503	82,820	950			27,810	416
Silver	50,148	1,505	17,388	724	444,578	17,597	5,000	112	477,989	18,602
							100	1		
Shad										
Smelt	5,100	195								
Steelhead trout	5,812	460			30,302	2,195	10,662	319	31,790	1,906
							2,000	100		
Sturgeon										
Total	172,608	5,043	156,630	3,318	1,839,333	56,744	129,642	5,345	724,043	26,230

Species.	Thurston.		Wahkiakum.		Whatcom.		Whitman.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Cod									4,700	$105
Flounders									600	18
"Lingcod"									300	7
Perch									9,400	294
Rockfishes									1,000	60
Salmon:										
Blueback or sockeye	2,800	$250	3,500	$175	44,740	$3,361			1,461,155	73,391
Chinook	330	20	1,346,900	67,331	29,520	1,541	825	$58	5,334,943	223,489
Chum	840	5	164,675	849	114,500	1,416			2,814,793	29,832
Humpback	3,340	85	700	9	23,372	296			420,134	6,182
Silver	2,190	65	68,140	1,376	417,617	16,843			2,760,754	87,295
Shad			3,912	36					32,209	320
Smelt					5,500	195			17,336	464
Sole									200	6
Steelhead trout			243,711	7,547	12,150	931			694,196	30,555
Sturgeon			5,260	288					28,200	1,363
Caviar									150	37
Total	9,500	425	1,836,798	77,611	647,399	24,583	825	58	13,580,070	453,418

BY BEAM TRAWLS.

Species.	Kitsap.		Pierce.		Thurston.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Flounders	2,600	$150					2,600	$150
Rockfishes	1,700	80					1,700	80
Sole	36,000	1,000					36,000	1,000
Shrimp	10,648	745	61,900	$2,785	30,530	$1,277	103,078	4,807
Total	50,948	1,975	61,900	2,785	30,530	1,277	143,378	6,037

STATISTICS OF THE YIELD OF THE SHORE FISHERIES OF WASHINGTON IN 1915, BY COUNTIES, SPECIES, AND APPARATUS—Continued.

BY POUND NETS.

Species.	Clarke.		Cowlitz.		Grays Harbor.		Jefferson.		King.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Grayfish							400,000	$900	100,000	$225
"Lingcod"									20,000	250
Salmon:										
Blueback or sockeye	2,000	$100					23,540	1,883	200,745	11,000
Chinook	145,125	6,100	758,250	$32,100	377,200	$7,544	585,460	$20,491	1,010,240	55,563
Chum	9,200	46	108,750	543	366,300	1,665	228,976	2,862	442,040	11,051
Humpback							816,820	10,210	1,576,004	15,760
Silver	24,000	660	158,500	3,680	527,000	10,540	481,086	16,036	793,716	29,103
Shad									3,878	160
Sharks							10,000	22		
Skates							6,000	13		
Smelt									10,599	375
Steelhead trout	23,125	694	36,437	1,092	22,500	1,350	18,575	1,300	93,288	6,997
Sturgeon	50	3	325	16	1,700	51	2,380	68	2,280	160
Total	203,500	7,603	1,062,262	37,431	1,294,700	21,150	2,572,837	53,785	4,252,790	130,644

Species.	Kitsap.		Klickitat.		Pacific.		Pierce.		San Juan.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Grayfish	220,000	$495							380,000	$855
Salmon:										
Blueback or sockeye	6,505	520	20,850	$1,042	76,667	$3,828	30	$3	18,325	1,649
Chinook	21,136	870	63,870	2,850	2,890,690	83,262	9,900	645	105,006	2,625
Chum	22,844	1,187			279,693	1,401	47,600	300	472	7
Humpback	11,492	205	1,104	13	1,760	22	3,200	80	321,272	4,016
Silver	30,373	1,471	66,600	1,500	718,607	14,371	9,900	300	165,114	6,879
Shad					8,223	52				
Sharks									12,000	26
Skates									8,000	18
Smelt					55	2				
Squid							15,000	325		
Steelhead trout	2,525	175	37,687	1,136	697,039	23,556	2,185	150	13	1
Sturgeon	78	5			2,600	104				
Total	314,953	4,928	190,111	6,541	4,675,334	126,598	87,815	1,803	1,010,202	16,076

Species.	Skagit.		Wahkiakum.		Whatcom.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Grayfish					800,000	$1,800	1,900,000	$4,275
Herring	2,200	$22					2,200	22
"Lingcod"	790,000	1,777					810,000	2,027
Salmon:								
Blueback or sockeye	480,250	42,074	4,615	$230	1,431,340	98,274	2,264,867	160,603
Chinook	1,397,000	56,375	1,096,921	40,747	2,070,222	87,550	10,531,020	396,722
Chum	383,500	7,460	44,336	224	388,456	8,001	2,322,167	34,747
Humpback	2,892,000	43,060	4,200	52	6,033,348	75,416	11,661,200	148,834
Silver	794,800	31,792	380,748	8,665	2,580,282	66,878	6,730,726	191,875
Shad	60	2	721	7			12,882	221
Sharks					5,000	11	27,000	59
Skates					3,000	7	17,000	38
Smelt	600	18					11,254	395
Squid							15,000	325
Steelhead trout	92,600	5,910	182,301	5,604	35,983	2,521	1,244,258	50,486
Sturgeon	840	50	503	29			10,756	486
Total	6,833,850	188,540	1,714,345	55,558	13,347,631	340,458	37,560,330	991,115

BY HOOP NETS.

Species.	Grays Harbor.		Pacific.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Crabs	169,885	$5,425	1,097,778	$34,200	1,267,663	$39,625

STATISTICS OF THE YIELD OF THE SHORE FISHERIES OF WASHINGTON IN 1915, BY COUNTIES, SPECIES, AND APPARATUS—Continued.

BY DIP NETS.

Species.	Clarke.		Cowlitz.		Wahkiakum.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Smelt	12,500	$125	1,603,500	$6,530	3,500	$40	1,619,500	$6,695

BY REEF NETS.

Species.	San Juan.		Whatcom.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Salmon:						
Blueback or sockeye	6,790	$611	12,500	$935	19,290	$1,546
Chinook	5,016	125	.....	.....	5,016	125
Chum	8,944	145	.....	.....	8,944	145
Humpback	92,948	1,162	21,200	265	114,148	1,427
Silver	22,584	941	.....	.....	22,584	941
Steelhead trout	225	15	.....	.....	225	15
Total	136,507	2,999	33,700	1,200	170,207	4,199

BY POTS.

Species.	Clallam.		Grays Harbor.		Island.		Jefferson.		King.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Crabs	26,667	$1,600	85,962	$2,675	112,625	$3,172	2,000	$90	1,793	$67

Species.	Pierce.		Skagit.		Snohomish.		Whatcom.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Crabs	2,500	$100	46,617	$1,318	10,000	$250	86,352	$2,525	374,516	$11,797

BY WHEELS.

Species.	Pacific.		Species.	Pacific.	
	Pounds.	*Value.*		*Pounds.*	*Value.*
Salmon:					
Blueback or sockeye	1,600	$80	Sturgeon	100	$6
Chinook	500	30			
Shad	397	4	Total	5,234	211
Steelhead trout	2,637	91			

BY LINES.

Species.	Clallam.		Clarke.		Franklin.		Grays Harbor.		Island.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Grayfish	.....	.....	.....	.....	.....	.....	.....	.....	800,000	$1,800
Halibut	42,000	$1,920	.....	.....	.....	.....	.....	.....	.....	.....
"Lingcod"	.....	.....	.....	.....	.....	.....	150	$2	.....	.....
Rockfishes	57,000	1,425	.....	.....	.....	.....	3,000	75	1,000	35
Salmon:										
Chinook	275,876	6,898	.....	.....	.....	.....	21,635	523	51,156	1,278
Chum	15,500	155	.....	.....	.....	.....	.....	.....	.....	.....
Humpback	22,650	282	.....	.....	.....	.....	750	9	4,200	52
Silver	1,453,299	36,234	3,700	$75	.....	.....	55,240	1,332	268,744	6,719
Sharks	.....	.....	.....	.....	.....	.....	.....	.....	46,000	100
Skates	.....	.....	.....	.....	.....	.....	.....	.....	32,000	72
Sturgeon	.....	.....	.....	.....	1,200	$90	.....	.....	.....	.....
Total	1,866,325	46,914	3,700	75	1,200	90	80,775	1,941	1,203,100	10,056

STATISTICS OF THE YIELD OF THE SHORE FISHERIES OF WASHINGTON IN 1915, BY COUNTIES, SPECIES, AND APPARATUS—Continued.

BY LINES—Continued.

Species.	Jefferson.		King.		Kitsap.		Mason.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Cod			300	$9				
Flounders			200	2	400	$32		
Grayfish	560,000	$1,255	604,662	1,362	310,000	697		
Halibut	12,000	960	15,000	645				
"Lingcod"	3,000	90	600	18				
Rockfishes			800	24	650	38	1,000	$35
Salmon:								
Blueback or sockeye			117	9				
Chinook	43,406	1,086	193,662	4,842	80,388	2,010	9,135	230
Humpback	3,450	43	18,400	220	6,600	83	750	10
Silver	265,178	6,629	1,017,388	25,435	422,312	10,558	47,990	1,200
Sharks	18,000	39	180,000	404	6,000	13		
Skates	12,000	29	78,000	173	4,000	9		
Soles					400	12		
Total	917,034	10,131	2,109,129	33,143	830,750	13,452	58,875	1,475

Species.	Pacific.		Pierce.		San Juan.		Skagit.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Grayfish			1,279,334	$2,879	380,000	$854		
Halibut					100	10		
"Lingcod"							500	$12
Rockfishes					2,000	70	1,000	40
Salmon:								
Chinook	95,050	$4,808	159,620	7,240	20,270	510	127,413	3,186
Humpback			9,000	113	1,500	20	10,350	129
Silver	590,300	12,617	575,880	14,397	101,980	2,650	662,762	16,569
Sharks			60,000	135	8,000	17		
Skates			40,000	90	8,000	19		
Steelhead trout	3,500	175						
Total	688,850	17,600	2,123,834	24,854	521,850	4,150	802,025	19,936

Species.	Skamania.		Snohomish.		Whatcom.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Cod							300	$9
Flounders							600	34
Grayfish							3,933,996	8,847
Halibut							69,100	3,535
"Lingcod"							4,250	122
Rockfishes							66,450	1,742
Salmon:								
Blueback or sockeye							117	9
Chinook			68,291	$1,782	82,215	$2,055	1,228,117	36,448
Chum							15,500	155
Humpback			4,950	62	6,750	84	89,350	1,107
Silver			325,134	8,243	431,910	10,798	6,221,817	153,456
Sharks							318,000	708
Skates							174,000	392
Soles							400	12
Steelhead trout							3,500	175
Sturgeon	500	$30					1,700	120
Total	500	30	398,375	10,087	520,875	12,937	12,127,197	206,871

STATISTICS OF THE YIELD OF THE SHORE FISHERIES OF WASHINGTON IN 1915, BY COUNTIES, SPECIES, AND APPARATUS—Continued.

BY TONGS, RAKES, ETC.

Species.	Clallam.		Grays Harbor.		Island.		Jefferson.		King.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Clams:										
Hard	2,520	$190	.....	.....	552	$45	17,944	$1,269	864	$110
Razor	.....	.....	297,430	$37,736	.....	.....	.....	.....	.....	.....
Oysters: Eastern, market	.....	.....	875	525	.....	.....	5,250	3,750	.....	.....
Total	2,520	190	298,305	38,261	552	45	23,194	5,019	864	110

Species.	Kitsap.		Mason.		Pacific.		Pierce.		San Juan.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Clams:										
Hard	35,760	$2,371	64,000	$4,111	.....	.....	5,680	$425	4,480	$490
Soft	.....	.....	.....	.....	1,200	$150	.....	.....	.....	.....
Razor	.....	.....	.....	.....	75,320	18,710	.....	.....	.....	.....
Oysters:										
Eastern, market	.....	.....	5,250	2,250	179,228	91,954	.....	.....	.....	.....
Native	.....	.....	38,654	22,035	9,709	4,755	4,200	1,725	.....	.....
Seed	.....	.....	8,680	2,530	12,201	5,229	133	47	.....	.....
Total	35,760	2,371	116,584	30,926	277,658	120,798	10,013	2,197	4,480	490

Species.	Skagit.		Snohomish.		Thurston.		Whatcom.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Clams:										
Hard	176	$25	1,760	$242	40,000	$2,743	2,008	$170	175,444	$12,191
Soft	.....	.....	.....	.....	.....	.....	.....	.....	1,200	150
Razor	.....	.....	.....	.....	.....	.....	.....	.....	372,750	56,446
Oyster:										
Eastern, market	.....	.....	.....	.....	14,091	9,394	.....	.....	204,694	107,873
Native	560	290	.....	.....	394,296	219,818	.....	.....	447,419	248,623
Seed	.....	.....	.....	.....	3,794	813	.....	.....	24,808	8,619
Mussels	.....	.....	.....	.....	700	83	.....	.....	700	83
Total	736	315	1,760	242	452,881	232,851	2,008	170	1,227,315	433,985

NOTES ON SPECIES.

Halibut.—Halibut is the most valuable species taken in the fisheries of Washington. The value of the catch in 1915 was nearly three times as great as that of chinook salmon, the next species in importance. The total production was 40,590,705 pounds, with a value to the fishermen of $2,041,279, as compared with 15,897,155 pounds, valued at $458,375, in 1904. The halibut were all taken with lines, and all but 69,100 pounds were taken in the vessel fisheries. Halibut on the Pacific coast average smaller in size than on the Atlantic coast.

The halibut vessel fishery on the Pacific coast really began when the schooners *Oscar and Hattie* and *Mollie Adams*, from Massachusetts, rounded Cape Horn and reached Puget Sound in 1888. The first fishing by these vessels was done during the summer and fall of that year, and the trips would have been very successful had it not been for the high price of ice. The total catch of the two vessels for the season amounted to 570,000 pounds of fresh and salted halibut, valued at $18,400. Some difficulty was at first experienced in freezing and getting the fish to the Atlantic coast markets in good condition, but with the introduction of refrigerator cars no further difficulty has

been encountered, and the shipments have steadily increased. The halibut fleet has increased from the 2 sail vessels just mentioned, in 1888, to a fleet of 97 vessels in 1915, most of them hailing from Seattle. While sail vessels were at first employed in the fishery, in 1915, with the exception of 5 steamers the halibut fleet consisted entirely of gasoline vessels, ranging in size from a few boats under 5 net tons to one of 115 net tons, and were usually owned by corporations. The crews vary from 5 to 19 men on the gasoline boats and from 37 to 44 men on the steamers. Some of the smaller boats do not carry any dories, the fishing being done from the deck. A large majority of the vessels are engaged exclusively in the halibut fishery, but a few discontinue purse seining at times to catch halibut. The number of dories carried varies from 2 on the small gasoline vessels to 12 on the larger steamers. The engineer, cook, and deck hands of a halibut vessel very seldom do any fishing.

Halibut are caught exclusively on trawl lines. The amount of gear used to a vessel ranges from 2 to 8 skates, a skate having a uniform length of 220 hooks placed 9 feet apart. There are ordinarily 7 lines, each 50 fathoms in length, to a skate. The lines are always set with the tide and wind. The men usually start out at about daybreak, and sometimes lines are set as late as 5 p. m. The gear is allowed to remain out about an hour before fishing is begun. From three to four hours are required to lift and fish a gear, the time varying according to amount set. The baiting is done on the fishing grounds just before setting out the lines. From the latter part of November to the last of January torches are used early in the morning and in the evening while fishing. The hooks commonly used are the Arthur James and Mustad hooks, Nos. 6283 and 6284, and are seized on the line with No. 12 linen twine.

Herring is the principal bait used; salmon are also used, but only in small quantities. Large numbers of herring from Puget Sound are utilized, but the main supply comes from Alaska, where many fishermen are occupied exclusively in catching bait for halibut vessels. In starting on a halibut trip it is customary to take 10 barrels of bait to each dory. A steamer will sometimes take as much as 200 barrels of herring on a trip. Bait is taken from Seattle only when going on a short trip. The herring bait is always used fresh, and in 1915 the cost was about $2 per barrel of 200 pounds. The price was about the same in Alaska.

In the early days of the fishery halibut were taken almost exclusively in the vicinity of Cape Flattery, but now the vessels go from 150 to 1,500 miles from Seattle, the nearest fishing bank being the one off Cape Flattery and the most distant one the Portlock Bank. The average length of a trip is 15 days, but some trips to nearby banks are made in 7 or 8 days. Besides the halibut banks already named, Hecate Straits and Yakitat Bank may be mentioned. The most prolific of these is Hecate Straits, 350 to 500 miles from Seattle. Very few vessels from Seattle go farther north than these grounds. While in that region the most convenient place for rebaiting is at Prince Rupert, Canada. In recent years, under an order in council passed at Ottawa, United States vessels can buy bait only upon condition that the catch is landed at Prince Rupert. This has had a depressing effect upon the halibut trade of Seattle, resulting in some of the larger wholesale firms moving to Prince Rupert.

Halibut are prepared for market by eviscerating and filling the cavity with ice. They are then covered with ice and kept in pens in the hold of the vessel to prevent them from sliding around. The heads of the fish are cut off upon the arrival of the vessel at the home dock.

The fishery is followed throughout the entire year except when the vessel is laid up for repairs. Owing to the long distance traveled and the rough weather often encountered, halibut fishing constitutes a dangerous occupation, some men being lost every year. In 1915, 60 men were lost.

In the early days of the halibut fishery the local demand was light, a vessel load of 20,000 pounds being sufficient to supply it. In addition to halibut, the vessels also bring in small quantities of sablefish, the total quantity in 1915 amounting to 575,810 pounds, valued at $13,782. This species is one of the most palatable fishes found on the Pacific coast, or elsewhere. For some unaccountable reason it has not been utilized to any great extent, but the indications now are that increasing quantities will be brought in annually.

Salmon.—The total catch of all species of salmon, including steelhead trout, in 1915 amounted to 91,130,492 pounds, valued at $2,330,474. The catch of the different species in the order of their importance was as follows: Chinook, 18,188,160 pounds, valued at $699,771; silver, 18,630,302 pounds, valued at $543,241; humpback, 29,998,291 pounds, valued at $367,521; blueback or sockeye, 5,043,374 pounds, valued at $345,810; chum, 17,156,244 pounds, valued at $282,842; and steelhead, 2,114,141 pounds, valued at $91,389. The greater part of the catch was utilized in canning. Large quantities were also used for freezing, smoking, salting, and mild curing. From the above, it will be seen that the fishermen received the following average prices per pound for the different species: Bluebacks, $6\frac{4}{5}$ cents; steelhead trout, $4\frac{3}{10}$ cents; chinook, $3\frac{4}{5}$ cents; silver, $2\frac{9}{10}$ cents; chum, $1\frac{3}{5}$ cents; and humpbacks, $1\frac{1}{5}$ cents.

Chinook.—Chinook salmon are taken in every county of the State having fisheries, but Pacific County, with a catch of 4,371,135 pounds, is far in the lead. The greater part of the catch is taken in the Columbia River. The pound-net fisheries at Chinook and gill-net fisheries at Ilwaco contribute a large part of the catch. Wahkiakum County, situated entirely on the Columbia River, ranks next to Pacific County, with a catch of 2,600,571 pounds. There are several very important fishing points in this county, but Cathlamet, with its valuable pound-net and gill-net fisheries, is the leading one. Whatcom and Skagit Counties, both on Puget Sound, also furnish large catches of chinook, pound nets being the principal apparatus of capture. Cowlitz County, on the Columbia River, and King County, on Puget Sound, are also deserving of mention for their output of chinook. This species is taken commercially as far from the coast as in the Snake River at Clarkston, Wash., opposite Lewiston, Idaho. It is an important item in the seine catch of that vicinity.

Chinook are found during the entire year in Washington, but the best catches are made between May 1 and September 15. Chinook average in size from 20 to 25 pounds, but some weighing 100 pounds have been taken. The size varies with the apparatus used. The average size of those taken in gill nets is probably less than those taken with some of the other apparatus, as a gill net with an extra

mesh, say from 8½ to 10½ inches, is necessary for the larger chinook, and comparatively few fishermen have these extra nets. Fishermen sometimes call the chinook "springs" until they are ready to spawn; after that they turn dark in color and are called "jacks." Large numbers of chinook are caught by trolling, but in 1915 the silver salmon replaced that species in importance. While large quantities of chinook are smoked, mild cured, and frozen, more than one-half of the entire catch is utilized for canning. There has been an increase in the output of this species since 1904 of 2,976,377 pounds, but a decrease in value of $1,784.

Silver salmon.—Silver salmon are taken quite generally throughout the waters of the entire State, Columbia and Garfield Counties on the Snake River alone failing to report any catch. The total output of Puget Sound was 14,753,946 pounds, as compared with 1,871,673 pounds credited to the Columbia River. A small quantity was taken commercially in the Snake River as far up as Clarkston, Wash. More than two-thirds of the total output of the State was utilized for canning. Large quantities were also salted and frozen. Pound nets and lines are the most important forms of apparatus used in taking silver salmon, two-thirds of the catch being taken by this means. The greater part of the remainder were taken in gill nets. Silver salmon follow bluebacks and run mainly from September 1 to the end of the year, but are scarce in December. They are of a more uniform weight than chinook, an average for the entire State being from 6 to 8 pounds, though some weighing 30 pounds have been taken. The output for 1915 as compared with that for 1904 shows a decline of 7,390,885 pounds and an increase of $40,220 in value.

Humpback.—Humpback salmon are important only on account of the large catches made, as the average price in 1915, as already shown, was only 1½ cents per pound. The total output was nearly one-third of that of all species of salmon combined. In 1915 this species constituted about one-half of the purse-seine catch, which is the most important apparatus used in their capture. Practically the entire catch is taken in the Puget Sound region and is utilized almost exclusively for canning. The average weight of the humpback is about 4 pounds. They are taken mainly in the summer and fall and appear in increased numbers every two years.

Blueback or sockeye.—This is the most valuable of all the salmon, as the average price, 6⅘ cents per pound, paid in 1915, indicates. By reason of the bright-red color of the meat and its rich flavor it is the most highly prized of the salmon for canning. More than one-half the catch was taken in the Puget Sound region, but the Quinault River in Grays Harbor County contributed most of the remainder. The blueback run extends from July 15 to the latter part of August. During this time they are being followed by purse-seiners through the Strait of Juan de Fuca to the south side of San Juan County and thence up the Rosario Strait northward to the Canadian line. The blueback is termed a Canadian fish by reason of being taken by American fishermen on its way to its spawning grounds in the Fraser River, Canada. Bluebacks sometimes reach a weight of 12 pounds, but the average weight is about 5 pounds. Heavy runs of this species occur periodically every four years, the last one being in 1913. It will thus be seen that 1915 would naturally be a slack year. The years of these large runs are called "big years." As compared with

1904, the canvass for 1915 shows a decline in the output of this species of 6,464,036 pounds in quantity and $181,678 in value.

Chum.—Next to the humpback, this species commands the lowest price of any of the salmon. The average price per pound in 1915 was 1⅔ cents. They are taken mostly in the Puget Sound region, purse seines being the chief means of capture, though large quantities are also taken with gill nets and pound nets. The run begins about September 20 and continues until the end of the year. Most of the catch is utilized for canning, but considerable quantities are sold frozen. The average weight of the chum salmon is about 8 pounds, though some weighing as much as 12 pounds have been taken. There has been an increase in this species since 1904 of 3,504,056 pounds, valued at $151,402.

Steelhead trout.—This species is taken very generally in the waters of Washington but is much more plentiful in the Columbia River, more than one-half of the State's entire catch being credited to that river. More than one-half of the catch was taken in pound nets and most of the remainder in gill nets. This fish is found in the Snake River as far up as Clarkston, Wash., and constitutes the most important part of the catch at that locality. It is more plentiful during the winter and until March 15, which accounts in a measure for the good price received. It is said to be not so attractive for eating during part of the spring and summer seasons. The skin then is dark in color, though the flesh is white. It is also quite thin at this time, following the spawning season. In 1915 the fishermen received on an average about 4 3/10 cents per pound. Only a small proportion of the catch is used for canning, as the steelheads are taken in largest quantities when the canneries are closed. Some are frozen, but the demand for the fresh fish usually equals the supply. Steelhead, like chinook salmon, vary much in weight, but an average would be about 12 pounds, though some reach a weight of as much as 45 pounds. There has been a fair increase, both in pounds and value, of this species since the last canvass for 1904.

Cod.—Eight schooners owned in Washington, with a combined crew of 268 men and 156 dories, made their annual trip to Alaskan waters in 1915 to prosecute the cod fishery. These vessels ranged from 138 to 413 tons net tonnage. The result of the trip was 5,498,284 pounds of salt cod, valued at $180,934, and 30,000 pounds of cod tongues, valued at $2,090. The round weight of the fish was 13,745,710 pounds. Four of these schooners were from King and four from Skagit Counties. The catch, which was taken entirely with hand lines, was dry-salted in Alaska and taken to Seattle and Anacortes, the hailing places of the vessels, where the fish were resalted and otherwise prepared for market.

The vessels usually leave their home ports about the middle of March, and after three weeks sailing arrive in the neighborhood of Shumagin Islands, in the North Pacific. They are then approximately 1,553 nautical miles from Seattle. As the fishing is followed mostly during the summer season, they have the advantage of long hours of daylight. The period of darkness during the fishing season rarely exceeds four hours, and is even less during June and July. Fishing with trawl lines for cod has been followed to some extent in the past, but very seldom now. The fishermen seem to prefer the

use of hand lines. The catch of cod has more than doubled, and the value nearly trebled since 1904.

Smelt.—Smelt are taken in most of the counties bordering on Puget Sound, but the fishing is usually incidental to the salmon fisheries of this region. The fishing season is from August 1 to April 30; during May, June, and July the season is closed. Until recent years the fishing season extended throughout the entire year. Short seines are used, the length ranging from 80 to 100 yards on an average and the depth from 200 to 400 meshes. The bunt is 25 yards long and is of 6 or 9 thread cotton twine with 1-inch mesh, while the wings are of 6-thread twine with 1¼-inch mesh. A seine is usually fished by two men.

Under smelt in this report are included eulachon, or candlefish, which are usually taken in the Cowlitz River near Kelso. In 1915, however, that river was so muddy that they continued up the Columbia to the Lewis River, where practically the entire catch was made. The fishing season is from January 1 to April 1, and they are taken in such large quantities that they soon glut the market. The price usually varies from $5 a box of 50 pounds, early in the season, to 10 cents a box after the season is well advanced. The output goes largely to Portland. Dip nets are the only form of apparatus used in the fishery. Since 1904 there has been an increase in the catch of 788,049 pounds, but there has been a decrease of $1,570 in value.

Grayfish.—This species in 1915 was used exclusively in the manufacture of fertilizer and oil. The total output used for this purpose amounted to 7,093,996 pounds, valued at $15,959. This is a new industry, as no grayfish were reported in the last canvass of this region by the Bureau covering the year 1904. They were taken mainly with seines and set lines, and often by men not regularly engaged in fishing.

Herring.—Herring are used almost exclusively for halibut bait. Practically the entire catch is taken in haul seines, principally in the vessel fisheries. Many purse-seine fishermen also have short-haul seines, which they use whenever the opportunity offers for making a good haul of herring. Some are sold to the halibut vessels direct and the remainder to dealers, mainly in Seattle, who freeze them for use later in the season. The increase in the herring output from 531,750 pounds, valued at $3,155 in 1904, to 2,129,149 pounds, valued at $9,655 in 1915, is due to the growth of the halibut fishery.

Sturgeon.—Sturgeon are found in small quantities in most of the waters of the State but are more frequent in the Columbia River. Pacific County, on the latter stream, with a catch of 17,100 pounds, valued at $784, and 300 pounds of caviar, valued at $75, leads all other counties in this fishery. This species, as in eastern waters, shows quite a marked decline. The total catch for Washington in 1915 amounted to 43,656 pounds, valued at $2,151, as compared with 125,127 pounds, valued at $4,050, in 1904.

Rockfishes.—Puget Sound is the northern limit for the black rockfish, the most important catches being made by Indians fishing with hand lines in the vicinity of Neah Bay. Considerable quantities are also taken in that region by troll fishermen, and small quantities with set lines in various localities. Red rockfish are not taken com-

mercially as far north as Washington. The total catch of rockfishes for the State in 1915 was 101,351 pounds, valued at $2,995, as compared with 82,700 pounds, valued at $3,498, in 1904.

Sole.—Sole are found in only small quantities as far north as Washington. Practically the entire catch was made with beam trawls, a few men in Kitsap County making a special fishery of it. This species is taken commercially in only four counties of the State, all on Puget Sound. The catch increased from 9,000 pounds, valued at $180, in 1904, to 68,062 pounds, valued at $1,951, in 1915.

Carp.—No commercial fishing for carp is followed in any of the streams of Washington, except the Columbia River, and in only one locality on that river. The total output in 1915 amounted to 200,000 pounds, valued at $4,000, which were shipped mainly to Seattle and Portland. Some were sent as far east as Butte, Mont. It is likely that the output could be increased were the markets to justify it.

Clams.—There has been quite a decline in the output of hard clams in Washington since 1904. The catch in 1915 was 21,968 bushels, valued at $12,191, as compared with 96,821 bushels, valued at $54,512 in 1904. The counties leading in the production of hard clams are, in the order of their importance, Mason, Thurston, Kitsap, and Jefferson. Several other counties produced small quantities. Olympia is the center of the hard-clam industry of the State. The hard clams are packed there in hermetically sealed cans of many sizes from 1 pint to 5 gallons and shipped as far east as Chicago. They are always shipped raw. The output of soft clams in the State in 1915 was insignificant. In the report for 1904 razor clams were tabulated with the soft clams, but in this report they are separated.

The output of razor clams in 1915 was 37,275 bushels, valued at $56,446. While the returns for 1915 show a substantial increase as compared with 1904, it is likely that the industry has been overworked, as some firms have dismantled their canneries and moved the machinery to Alaska for operation there.

Razor clams are found exclusively along the ocean beach of Grays Harbor and Pacific Counties. In Oregon they are found for only a short distance along the ocean beach from the mouth of the Columbia River south. They are taken between tides at extreme low water, the width of the beach on which they are taken being about 50 yards. The fishing can be done only on "minus" tides; that is, tides running below mean low water. Considerable skill and dexterity are required in capturing them, as they are very quick in their movements. If the first effort with the shovel to catch one is not successful, all chances of getting it at that time are gone. The method followed is to insert the shovel quickly in the sand below the clam and make a quick upward movement, the fisherman placing his hand under the shovel to catch the clam in its efforts to retreat. The legal season for taking razor clams is from September 1 to May 31, the remainder of the year constituting a closed season except for family use. But it is not always possible during the open season to catch them, as the particular stages of the tide when they can be taken occur at only certain intervals.

A brief description of canning razor clams follows: The clams are first put in a hot bath to loosen the shells. After going through the bath, the shells are removed either by hand or by a shelling machine, consisting of an endless chain or pulley. Both methods are fol-

lowed. The shells being removed, the clams then go to women who remove the intestines, after which they are sent to the chopper. From the chopper they are fed into the cans, and the latter are sent to the sealing machines and thence to the retort, which completes the operation, except labeling. The approximate time the cans are left in the retort varies from 45 minutes to 2 hours and 20 minutes, according to the temperature. The first clam cannery in Washington was established in Seattle in 1875, and had a capacity of two hundred 2-pound cans a day.

Oysters, native and eastern.—The total production of oysters in Washington in 1915 amounted to 64,342 bushels of native oysters, valued at $250,298, and 37,859 bushels of eastern oysters, valued at $140,028. This indicates an average price per bushel of $3.89 for native and $3.69 for eastern oysters. Comparing the production of native oysters in 1915 with that of 1904, we find a loss of 58 per cent in quantity but only 10 per cent in value. The eastern oysters during the same period show a decrease of less than 2 per cent in quantity and an increase of 14 per cent in value. An illustration of the decrease in the output of native oysters is shown in Pacific County. In 1904 the production in that county amounted to 60,000 bushels, while in 1915 it had dwindled to 1,412 bushels. This has contributed to increasing the price of native oysters along the entire Pacific coast.

Olympia is the center of the native oyster industry of the State, and Shelton, in Mason County, also has a thriving oyster industry. Many of the inlets near these two towns are utilized for oyster-planting purposes. More native oysters are produced in the vicinity of these two towns than in all the remaining towns of the Pacific coast combined. Conditions seem well adapted here to their cultivation. Very few eastern oysters are handled at these places. The oyster season of this region in 1915 suffered a handicap by reason of a freeze occurring toward the end of the season, which killed large numbers of oysters. In the earlier days of the industry the grounds were always bare at low water, and many oysters died during the cold weather. To prevent this, dykes were built to hold the water and lessen the exposure of the oysters to the weather. Another and probably the main reason for building the dykes, however, was to establish a seed-producing area, as the public reserves had then become very much depleted, and it was difficult to secure seed with which to stock the grounds.

It is said that the first attempt at native-oyster cultivation in the vicinity of Olympia was about 1880, and the business has been continued ever since. The supply does not meet the demand, and for this reason the oysters are often sold before reaching maturity. Another probable reason, however, for early marketing is to avoid the danger of freezing when the tide is out. The dykes have to a considerable extent lessened this danger. Shells have been planted within the dykes for the collection of spat and also to prevent the oysters settling in the mud.

The average oyster season is from early in September to early in May. Some of the oysters are shipped in the shell, but a majority are shucked and shipped in cans of various sizes, holding from 1 pint to 5 gallons. The cans are hermetically sealed, but the oysters are not cooked. Shipments are made as far east as Chicago. It is likely

that about one-half the output goes out of the State, mostly to California, Oregon, Idaho, Utah, Montana, and some to British Columbia. As is well known, this native oyster is very much smaller than the eastern one.

The eastern oyster is produced in several counties of the State from Samish Bay, in Skagit County, to Willapa Harbor, in Pacific County, but 84 per cent of the output is from the latter water. Shoalwater Bay, an arm of Willapa Harbor, is especially suitable for the culture of the eastern oyster, and it is said that so far as known the southern part of this bay is the only place on the Pacific coast where the eastern oyster will propagate and successfully develop. The most important oyster centers in this region are Nahcotta, Tokeland, South Bend, and Bay Center. Little attention is paid now to the native oyster at these localities as compared with times past. It is authoritatively stated that the first eastern oyster was brought to Willapa Harbor for planting in 1894. The shipment was made by J. & J. W. Ellsworth Co., of New York, under the direction of the U. S. Fish Commission. Although conditions seemed favorable for the continued planting of eastern oysters in this region, practically nothing more was done for several years, due largely to the freight rates, which were almost prohibitory. About the year 1900 the business took on new life and continued to grow until 1907, when it slacked up from lack of demand. Little planting was done during the following years until the spring of 1912, when six carloads of seed oysters were brought from the east and planted. Allowing the usual time for maturing, these oysters were probably marketed in 1914 and 1915. The planters seem to prefer "set" for planting, as they can get more out of a bushel and they develop into a better oyster than older stock. The demand for eastern oysters is now so great that they are rarely left on the beds after reaching 3 years of age. The high freight rates and heavy mortality contribute largely to the high price of these oysters. Some Japanese oysters have been planted in Willapa Harbor, but they did not meet with sufficient favor to justify further planting.

The oyster grounds occupied by planters in Washington have been purchased and deeded by the State to the owners. This deed holds good only so long as the land is devoted to oyster culture.

Seed oysters.—During the year 1915, 3,544 bushels of seed oysters, with an estimated value of $8,619, were taken by planters from State reserves. The reserves are tidewater grounds owned by the State, certain portions of which are opened up to planters each year between April 1 and June 15 for taking seed stock. Each planter is allowed 500 sacks of 120 pounds each for every acre prepared by him for seeding, and no seed stock can be sold.

Crabs.—Crabs are taken entirely with hoop nets and pots, the total catch with both forms of apparatus in 1915 amounting to 1,734,401 pounds, having a value to the fishermen of $54,526, showing an increase since 1904 of 174 per cent in quantity, and 102 per cent in value. All but 92,231 pounds, valued at $3,104, were taken in the shore fisheries. Crabs are taken commercially in almost all of the counties bordering on Puget Sound and in Grays Harbor and Pacific Counties bordering on the ocean. In the two last-named counties the fishing is followed almost entirely in the ocean. The most important coast centers in the State are Bay Center, Tok-

land, and South Bend, in Pacific County; Westport, in Grays Harbor County; Utsaladdy, in Island County, and Dungeness, in Clallam County.

Shrimp.—The total catch of shrimp in 1915 amounted to 386,420 pounds, valued at $18,719, taken entirely with beam trawls. Nearly three-fourths were taken in the vessels fisheries and the remainder in the shore fisheries. They were taken in all parts of Puget Sound, but the greater part of the shrimp fleet was owned and operated from Olympia and Tacoma and vicinities. An important industry in Olympia is the picking out and shipment of shrimp meat.

Whales.—The whaling industry of Washington, aside from some work done in Bering Sea by a coasting steamer owned in Seattle, was confined entirely to one locality in Pacific County. Three steamers are employed from the latter place and a plant is located there for the manufacture of fertilizer and oil from the whales.

These steamers go from 20 to 150 miles from port in search of whales. Four species of whales are taken; finbacks, sperm, humpbacks, and sulphur-bottom. In 1915, 252 humpbacks, 66 finbacks, 15 sperm, and 1 sulphur-bottom were taken. Some whalebone was taken by the whaling steamer out of Seattle, working in Bering Sea, but that taken from the whales captured by the steamers from Pacific County was not of sufficient length to give it any commercial value.

Practically every part of the whales taken by the Pacific County steamers was utilized, except the water extracted from them. The flesh, blood, and bones contributed to the manufacture of fertilizer. As soon as the whale is brought in, unless it be at night, the blubber is stripped off and the meat cut into chunks of about 10 pounds each. The bone is then chopped up and put into tanks, after which the cooking process begins. The meat is put into vats holding 6 tons each, where it is boiled until thoroughly cooked, the oil being extracted while cooking by dipping it off by hand with long-handled dippers. This applies to oils Nos. 2 and 3, known as whale oil. The meat is then put into a press and the residue of oil extracted, after which it passes through a drier and comes out as dry scrap, in which shape it is sold; as it contains 15 per cent of ammonia it is considered a high-grade material for fertilizer.

After stripping off the blubber it is passed through a slicer into boiling tanks, having a capacity of 20 tons each, where it is cooked in the same manner as the meat. After cooking, it is allowed to stand until the following day, when the oil is run off into oil coolers or collectors, when it is ready for market. Practically all of the oil from the blubber is No. 1. The different kinds, or grades of oil are all manufactured in exactly the same manner, the difference in grades being determined by the colors. No. 1 is white, No. 2 is dark straw color, No. 3 is still darker, and No. 4 is almost black. The fresher the whale, or the more quickly it is utilized after killing, the better the oil secured. The latter gets dark by holding the whale.

Most of the oil is sold to soap manufacturers, one large firm in the Middle West getting the greater part of it. It is all shipped in tank cars. The best grade is an excellent machine oil.

In the case of the sperm whale the oil is extracted by tapping the head of the whale and letting the oil run out into a vat.

The bone of the whale is boiled in the same manner as the meat. After the oil is extracted, the bone is taken out into an open yard and allowed to remain there for several months, or until the end of the season, in October, when it is ground and put through a drier and then through a mill, when it is ready for market as bone meal. This is considered a good fertilizer without other ingredients and is so sold. An analysis has shown that it contains 23.79 per cent of phosphoric acid, which places it among the high-grade fertilizers.

Ratfish.—This fish is quite common along the Pacific coast, but as yet no commercial use has been made of it. It is often found by men fishing for grayfish. The liver of this fish is said to furnish an oil better even that cod-liver oil for tuberculosis and kindred ailments, and is quite extensively used in the Scandinavian countries and in Germany.

WHOLESALE FRESH-FISH TRADE.

The most important wholesale firms of the State, aside from canneries, are located at Seattle, though a considerable fresh-fish trade is done at Tacoma and Everett, especially the former city. In 1915 there were 14 firms in the State handling fresh fishery products only. The value of these establishments was $153,075, the cash capital invested was $26,100, the number of persons engaged was 79, and the wages paid amounted to $50,350. Three of these firms, which handled crabs, cooked a few of the crabs before shipment.

FISHERY PRODUCTS PREPARED, EXCLUSIVE OF CANNING.

The total amount of fish frozen in the State was 8,812,127 pounds, valued at $371,854. This includes fish frozen by refrigerator plants for wholesale dealers. The most important species frozen, based on their value, were halibut, chum, silver, and chinook salmon, and herring, the latter being utilized mostly for halibut bait. Sablefish and smelt were also frozen in considerable quantities.

The mild-cured trade in Washington was confined to chinook and chum salmon, divided as follows: 1,208,800 pounds of chinook salmon, valued at $130,052, and 83,000 pounds of chum salmon, valued at $2,060. The mild curing was all done at Seattle, Tacoma, and Altoona, Wash.

The wholesale salting trade in 1915 amounted to 1,788,200 pounds, valued at $106,493, most of it being silver salmon. Considerable quantities of halibut and sablefish and small quantities of several other species were also salted. Seattle and Tacoma were the headquarters for the salting trade.

The smoking of fish was quite an important industry in the State. The total quantity smoked in 1915 was 2,058,210 pounds, having a value of $193,301. The principal smoking centers are Seattle, Tacoma, Everett, and Bellingham. Chinook salmon and sablefish were the most valuable smoked fish, though halibut, cod, chum salmon, and herring also were smoked in considerable quantities.

The following is a brief description of a smokehouse and method of smoking: A smokehouse is approximately 15 by 30 feet and 3 stories

high from the basement to the roof. A square or round building is preferable, so as to insure a more even distribution of heat and smoke. The fire is maintained in the center of the building, in the basement or on the first floor. Each fish is hung on three sticks, or on metallic hangers, depending upon the size to be smoked. Small fish are placed on sticks and large ones on metallic hangers. They are suspended from the second and third floor levels. A slow fire is maintained from four to seven days, depending upon the kind of fish to be smoked. Alder wood and hardwood sawdust are used entirely. Sawdust is used to make a smoldering fire with a great deal of smoke but little heat. The kippering process differs from the regular smoking process only in that the fish are placed on trays similar to a broiler in the oven at home, and the alder-wood fire is maintained up to the neighborhood of 300° F. for two hours. By this time the fish is thoroughly cooked from the heat and cured by the smoke. It is then ready to eat.

Among the miscellaneous fishery products prepared were 1,927 tons of fertilizer from fish and fish offal, valued at $77,560; 171,245 gallons of oil, valued at $50,555; 41,038 gallons of glue, valued at $36,200; 212 tons of poultry feed, valued at $10,370, from the same source; 133,689 pounds of shrimp meat, valued at $38,303; 5,000 pounds of potash, valued at $1,125, from kelp; and 150 tons of ground clam shells, valued at $1,500. The oil mentioned above is used largely for tanning leather, while some made from grayfish livers is used in the manufacture of fine grades of soap. It is also said to be good for medicinal purposes, but no such trade has yet been established.

Statistics for products prepared, exclusive of canning, in Washington in 1915 are shown in table, page 54.

CANNING INDUSTRY.

In 1915 there were in Washington 76 canneries, distributed by districts as follows: Forty-nine, valued at $4,541,103, in the Puget Sound region; 15, valued at $318,685, in the Grays Harbor district; 7, valued at $164,900, in the Willapa Harbor district; and 5, valued at $293,329, on the Columbia River. A total of $424,000 working cash capital was employed, 4,525 persons were engaged, and $1,279,787 were paid in wages. Of these canneries all but a few were engaged in canning salmon. The remainder handled clams, clam juice, oysters not cooked, oyster cocktails not cooked, and shrimp cocktails. Some of the salmon canneries included in their output a few cases of canned shad, shad roe, clams, and clam juice. The total pack of salmon in the State was as follows: 590,378 cases of humpback, valued at $1,772,565; 178,464 cases of chinook, valued at $1,400,220; 450,409 cases of chum, valued at $1,219,061; 206,508 cases of silver, valued at $1,036,859; 91,720 cases of blueback, valued at $932,394; and 10,270 cases of steelhead trout, valued at $64,860. The other canned products consisted of 49,337 cases of clams, valued at $211,008; 270 cases of clam juice, valued at $1,050; 7,505 gallons of clams not cooked, valued at $4,066; 4,944 gallons of clam juice not cooked, valued at $2,427; and 49,103 gallons of oysters not cooked, valued at $120,513. A case of salmon represents 48 pounds, but there is no uniform weight to a case of clams. The clams indicated as not cooked

are put up in hermetically sealed cans, which, if stored on ice, will keep from one to three weeks and are sometimes shipped as far east as Chicago. This applies also to the clam juice and oysters.

As the heaviest runs of salmon in the Puget Sound region occur during the warmer weather, it is difficult to keep the fish in good condition very long, and for this reason it was soon recognized as necessary that the canneries be located as near the salmon grounds as possible. In the early stages of the industry some canning was done at West Seattle, but it was discontinued after the buildings were twice destroyed by fire. The most important salmon-canning centers of Washington now are Anacortes, Blaine, Everett, and Bellingham, all being favorably located to the fishing grounds. Many of the canning companies still maintain offices in Seattle.

In 1915 a company in Whatcom County smoked the salmon before canning. The following is a brief description of the process through which the salmon passed before being canned: The salmon are first placed in a concrete tank, from which they are taken and passed through a machine which cleans and eviscerates them and cuts off the heads and tails. The fish, after being cut into sizes suitable to the size of the can, are taken to the smokehouse, where they are put on trays. Extending lengthwise down the middle of the smokehouse from floor to ceiling are 12 inclosed compartments or chambers, 8 by 12 feet in size. Each of these chambers holds 56 wire trays, 2 by $3\frac{1}{2}$ feet in size, divided into groups of 14, placed one above the other. The bottom tray is 27 feet above the fire and 20 feet below the top of the building. That part of the chamber holding the trays is about 6 feet in height. There is a ventilator over each chamber extending out through the roof of the building. A draft hole near the bottom of each chamber or floor of the building enters the space where the fire is located. The salmon remain in the chambers about 24 hours, or a trifle less. The capacity of this smokehouse is 35,000 pounds. Alder wood was at first used, but it has since been replaced by oak. This building was built only recently, and it is therefore believed to possess the most modern ideas.

An advantage to the dealer in smoking the salmon before canning is that it gives the inferior grades of fish the same color as those of a higher grade, such as the blueback. The dealers claim that there is not nearly so much difference in the quality of salmon meat as the color would seem to imply. In proof of this statement it is said that fish brokers have been unable to distinguish between smoked chum and smoked blueback.

Extent of the Canning Industry of Washington in 1915, by Districts.

Items.	Puget Sound.		Columbia River.		Grays Harbor.		Willapa Harbor.		Total.	
	Number.	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*
Establishments	49	$4,541,103	5	$293,329	15	$318,685	7	$164,900	76	$5,318,017
Cash capital	.....	279,700	.....	26,000	.....	73,700	.....	44,600	.....	424,000
Persons engaged	3,494	.....	209	.....	682	.....	140	.....	4,525	.....
Wages paid	.....	1,042,338	.....	107,200	.....	95,509	.....	34,650	.....	1,279,787
PRODUCTS.[a]										
Salmon:										
Chinook—										
1-pound tall....cases	11,553	54,726	17,697	134,069	2,997	13,585	6,030	36,620	38,277	239,000
1-pound flat....do	[b]7,104	37,872	55,240	436,004	3,084	11,147	9,723	76,408	75,151	561,431
1-pound oval....do	.....	.....	.....	.....	.....	.....	192	1,632	192	1,632
½-pound flat....do	4,999	47,896	47,710	438,461	1,999	16,583	10,135	95,217	64,844	598,157
Blueback or sockeye—										
1-pound tall....do	579	4,429	550	4,290	968	6,776	.....	.....	2,097	15,495
1-pound flat....do	8,350	71,542	.....	.....	2,073	16,584	8	64	10,431	88,190
½-pound flat....do	55,384	594,999	1,267	11,735	22,323	219,795	218	2,180	79,192	828,709
Silver—										
1-pound tall....do	116,694	551,760	1,985	9,925	9,925	39,947	4,932	19,799	133,536	621,431
1-pound flat....do	27,884	142,766	200	920	1,693	7,701	.....	.....	29,777	151,387
½-pound flat....do	38,005	231,539	1,794	12,913	1,779	8,315	1,617	11,274	43,195	264,041
Humpback—										
1-pound tall....do	551,516	1,608,153	.....	.....	525	1,940	.....	.....	552,041	1,610,093
1-pound flat....do	[c]11,128	37,243	.....	.....	.....	.....	.....	.....	11,128	37,243
½-pound flat....do	27,094	124,631	.....	.....	115	598	.....	.....	27,209	125,229
Chum—										
1-pound tall....do	407,706	1,105,465	9,575	23,956	25,450	66,138	6,243	18,325	448,974	1,213,884
1-pound flat....do	733	2,345	.....	.....	27	50	.....	.....	760	2,395
½-pound flat....do	657	2,710	.....	.....	18	72	.....	.....	675	2,782
Shad:										
1-pound tall....do	.....	.....	1,228	3,684	.....	.....	.....	.....	1,228	3,684
½-pound flat....do	.....	.....	335	1,882	.....	.....	.....	.....	335	1,882
Shad roe: ½-pound flat....do	.....	.....	46	460	.....	.....	.....	.....	46	460
Steelhead trout:										
½-pound tall....do	.....	.....	6,682	39,792	.....	.....	1,698	11,500	8,380	51,292
1-pound flat....do	.....	.....	.....	.....	.....	.....	500	4,000	500	4,000
½-pound flat....do	.....	.....	494	3,177	.....	.....	896	6,391	1,390	9,568
Clams:										
No. 1, whole....do	264	1,046	.....	.....	1,057	4,306	.....	.....	1,321	5,352
No. 1, minced....do	1,632	6,528	.....	.....	16,375	76,407	2,662	9,180	20,669	92,115
No. 2, whole....do	2,450	6,615	.....	.....	.....	.....	.....	.....	2,450	6,615
No. 2, minced....do	4,249	12,322	.....	.....	1,672	12,100	168	504	6,089	24,926
Halves, minced....do	50	220	.....	.....	18,414	80,747	188	564	18,652	81,531

[a] All products except clams and clam juice, which have no uniform weight, represent 48 pounds to the case.
[b] Includes 553 cases smoked before canning.
[c] Includes 656 cases smoked before canning.

EXTENT OF THE CANNING INDUSTRY OF WASHINGTON IN 1915, BY DISTRICTS—Continued.

Items.	Puget Sound.		Columbia River.		Grays Harbor.		Willapa Harbor.		Total.	
	Number.	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Nuuber.*	*Value.*	*Number.*	*Value.*
Clams—Continued.										
Quarters, minced.....cases..					156	$468			156	$468
No. 10, whole (not cooked).....gallons..	6,012	$3,506			1,494	560			7,506	4,066
Clam juice:										
No. 1.....cases..	30	104							30	104
No. 2.....do....	75	187			165	759			240	946
No. 10 (not cooked).....gallons..	1,200	400			3,744	2,027			4,944	2,427
Oysters (not cooked).....do....	49,103	120,513							49,103	120,513
Oyster cocktails (not cooked).....4-ounce bottles..	2,184	212							2,184	212
Shrimp cocktails.....do....	2,196	213							2,196	213

FISHERIES OF OREGON.

While not the least of the three States on the Pacific coast in point of area, Oregon presents the shortest water front and ranks third in the extent of its fisheries.

The number of persons employed in the fisheries and fishery industries of Oregon during the year 1915 was 5,900; of these 23 were engaged on fishing vessels of 5 tons net or more; 60 on vessels engaged in transporting fish and fishery products; 4,472 in the shore, or boat, fisheries; and 1,345 on shore, in canneries, fish houses, etc.

The investment in the fishery industries during the year was $4,064,151, of which $25,935 was credited to 5 fishing vessels; $96,034, to 30 transporting vessels; $582,485 to 1,382 gasoline boats; $69,805 to 1,264 other small boats of various descriptions; $757,170, to all apparatus used in the fisheries of the State; $2,083,913, to shore and accessory property; and $448,809, to working cash capital.

The products of the fisheries of the State in 1915 amounted to 34,692,863 pounds, valued at $1,479,021. The various regions contributing to this total are, in the order of their importance, as follows: Columbia River district, 27,879,438 pounds, valued at $1,271,357; Rogue River, 1,133,331 pounds, valued at $66,298; Pacific Ocean, 596,059 pounds, valued at $30,415; Tillamook Bay, 1,191,488 pounds, valued at $24,516; Nehalem River, 893,630 pounds, valued at $17,493; Umpqua River, 669,663 pounds, valued at $12,425; Coquille River, 549,804 pounds, valued at $10,914; Siletz River, 310,454 pounds, valued at $9,994; Coos Bay, 348,881 pounds, valued at $8,411; Nestucca River, 353,059 pounds, valued at $8,207; Alsea Bay, 391,562 pounds, valued at $7,346; Yaquina Bay, 169,560 pounds, valued at $6,071; Siuslaw River, 117,526 pounds, valued at $2,530; Chetco River, 43,130, pounds, valued at $2,149; and Necanicum River, 45,278 pounds, valued at $895.

The Columbia River catch is so far in excess of all the other regions combined as to render it worthy of special mention. The catch in that river in 1915 amounted to 27,879,438 pounds, valued at $1,271,357. Of this quantity 27,036,808 pounds, valued at $1,239,001, over 96 per cent of the total, were salmon, and the greater part of these, or 20,454,002 pounds, valued at $1,091,156, were chinook salmon. The remainder of the salmon catch was blueback, chum, silver, and steelhead. Humpback salmon are rarely seen this far south. Columbia River has what is known as a "spring" run and a "fall" run of salmon, though the interval between the two seasons is very limited, the closed period extending only from August 25 to September 10. The spring run of chinook was better in 1915 than for several years, and the fall run was very good for the first week or two after the opening of the season, but after that it seemed to diminish. The bluebacks, which accompany the spring run of chinooks, were so few in 1915 as to be almost a failure; they seem to have been very scarce for two years. The chum salmon, which run from about the middle of August until late in November, show a fairly good catch for the year under consideration. The silver salmon usually appear about midsummer and continue until some time in November; the catch of silvers was not so good as in past years. The run of steelhead was about normal.

Commercial fishing in this river covers a distance of 200 miles or more from the mouth of the river to Celilo Falls, in Wasco County, but the major portion of the work is done within 40 or 50 miles of the mouth and chiefly with gill nets. Important seine fisheries are located on the sand bars near Astoria, these grounds being leased from the Government. Comparativly little pound-net fishing is done on the Oregon side of the river, this method being used principally on the Washington side in a widened portion of the river known as Bakers Bay, located just within the mouth of the river. Fish wheels are of both the scow and stationary type and are located at various points on the upper river above the mouth of the Willamette River.

Considered as a whole, the 1915 pack was slightly above the normal, but the fall pack was light, due to the fact, above stated, that the fall run of chinook salmon dropped off early.

Considerable quantities of salmon have been mild cured on this as well as other rivers of Oregon in the past years, mostly for export to the German trade, but this demand has decreased to such an extent since the beginning of the European war that the output of this product has suffered a marked decline. The loss of the foreign trade, however, has been partly offset by an increased domestic demand, and it is believed that with proper effort this business can be made independent of the export trade.

During the last year or two a very important troll-line fishery has been established by the fishermen of Columbia River. This work is carried on chiefly during the interval between the spring and fall seasons, when gill-net fishing is prohibited, though some follow it prior and subsequent to that period. The boats are of an especially good type, propelled by gasoline engines of sufficient power to enable them to go out in very rough seas; the fishing is done in the ocean about 5 or 6 miles from the mouth of Columbia River and sometimes down as far as Tillamook Head. One boat will sometimes fish as many as five to seven lines, fixed on outriggers. The troll-line catch is practically all chinook salmon.

The statistics as to number of persons employed, investment, and products of the fisheries of Oregon in 1915 are given in the table, page 51. The yield of the fisheries of the coastal waters of the State is given in the following table:

YIELD OF THE FISHERIES OF THE COASTAL WATERS OF OREGON IN 1915.

Species.	Columbia River.		Necanicum River.		Nehalem River.		Tillamook Bay.		Nestucca River.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Carp	50,000	$750								
Salmon:										
Blueback	337,027	16,848								
Chinook	20,454,002	1,091,156			371,024	$9,212	479,923	$11,988	161,901	$4,047
Chum	1,454,024	8,391	3,220	$45	176,330	883	290,230	1,454		
Silver	2,500,766	50,248	42,058	850	322,632	6,453	347,514	6,953	174,268	3,485
Shad	488,625	4,945								
Steelhead trout	2,290,989	72,358			23,644	945	5,261	211	16,890	675
Sturgeon	97,785	5,014								
Tomcod	22,500	900								
Clams, soft							16,560	2,285		
Crabs							52,000	1,625		
Crawfish	183,720	20,747								
Total	27,879,438	1,271,357	45,278	895	893,630	17,493	1,191,488	24,516	353,059	8,207

Species.	Siletz River.		Yaquina Bay.		Alsea Bay.		Siuslaw River.		Umpqua River.	
	Pounds.	*Value*	*Pounds.*	*Value*	*Pounds.*	*Value*	*Pounds.*	*Value*	*Pounds.*	*Value.*
Flounders			1,965	$40						
Herring			10,500	263						
Perch			11,930	360						
Salmon:										
Chinook	167,064	$8,197	44,328	1,601	206,615	$4,124	33,180	$829	112,923	$2,265
Chum	36,720	185			16,225	83			5,130	40
Silver	106,670	1,612	43,420	1,085	99,960	1,500	83,306	1,670	548,610	10,000
Smelts			3,500	175						
Steelhead trout					1,200	48	1,040	31	3,000	120
Clams, soft			330	49	430	64				
Oysters, native, market			1,547	725						
Crabs			52,040	1,773	67,132	1,527				
Total	310,454	9,994	169,560	6,071	391,562	7,346	117,526	2,530	669,663	12,425

Species.	Coos Bay.		Coquille River.		Rogue River.		Chetco River.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Carp									50,000	$750
Flounders									1,965	40
Herring									10,500	263
Perch									11,930	360
Salmon:										
Blueback									337,027	16,848
Chinook	132,177	$3,304	207,138	$5,467	1,081,457	$65,001	30,560	$1,833	23,482,292	1,209,024
Chum									1,981,879	11,081
Silver	181,450	3,629	330,046	5,049	51,874	1,297	12,270	306	4,844,844	94,137
Shad									488,625	4,945
Smelts									3,500	175
Steelhead trout	10,914	435	12,620	398			300	10	2,365,858	75,231
Sturgeon									97,785	5,014
Tomcod									22,500	900
Clams, soft	5,140	643							22,460	3,041
Oysters, native, market									1,547	725
Crabs	19,200	400							190,372	5,325
Crawfish									183,720	20,747
Total	348,881	8,411	549,804	10,914	1,133,331	66,298	43,130	2,149	34,096,804	1,448,606

FISHERIES BY COUNTIES.

The commercial fisheries of Oregon were prosecuted in 15 counties during the year 1915. This number includes every county on Columbia River from the mouth up to and including Wasco County at Celilo Falls, several counties on Willamette River, a tributary of Columbia River, every county on the coast, and also Josephine County, which, though located inland, has a run of salmon in Rogue River

which passes through the county en route to the ocean. In considering the fisheries of the various counties they will be taken up according to their rank as regards the value of the catch.

Clatsop County.—This county, with its extensive salmon-canning industry, located at Astoria, ranks far above any other in the State. The catch for the year was 22,676,724 pounds, valued at $1,039,955. The great bulk of this catch was salmon, with chinook far in excess of the others; the catch of chinook was 16,167,867 pounds, valued at $886,585. Next to the salmon, the most important catch was razor clams, of which 77,200 pounds, valued at $10,900, were taken on the coast. The fisheries here support five canneries, all located at Astoria, on Columbia River; four of them also canned small quantities of shad and shad roe in 1915.

Several of the firms also froze small quantities of salmon, shad, shad roe, and sturgeon. Six clam canneries were operated on the ocean side of this county in 1915, but the pack was not up to normal because the clams seem to have been on the decrease for several years. One of the canneries also packed a very small lot of salmon. Considerable crab fishing has been done from Astoria during the last few years. The greater part of this work is done from January to June, and during the early part of this period it is frequently too rough for the boats to reach the crab-fishing grounds, which are located principally beyond the Columbia River bar at the mouth of the river; they often go as far as 15 to 20 miles when crab fishing. But for this obstacle greater effort would undoubtedly have been made in this line. The crabs are taken with a sort of dip net or hoop net, made of cotton twine, hung on iron hoops, two hoops to each net, placed one above the other, about a foot apart; the nets are sunk and buoyed so that they may be located easily.

The most important form of apparatus in Clatsop County is the gill net, the catch of which was 14,607,184 pounds, valued at $641,041; the great bulk of this was salmon, with small quantities of shad and sturgeon. Seines occupy the next place in point of importance, the catch with these being 6,024,288 pounds, valued at $302,764. The line and pound-net fisheries also add considerable quantities to the salmon catch of this county.

The investment of Clatsop County was $2,076,577, an amount greater than that of all the other counties combined.

Columbia County.—This county ranked second in the value of the catch, but the amount invested was less than in some other counties. This is probably due to the fact that some of the other counties have canneries, and these buildings add considerably to the investment, while Columbia County has no canneries or fish houses of any kind, except a small wholesale fresh-fish house at Rainier. Practically all the fish caught by the fishermen of this county are sold to the canneries at Astoria. The catch amounted to 2,711,569 pounds, valued at $114,911. The investment for the year was $176,162, this amount consisting chiefly of the value of gasoline boats and gill nets.

This county adjoins Clatsop County and borders on that part of the Columbia River where the fishing grounds are especially prolific, and, as in the latter county, owes its importance principally to the gill-net fisheries, the catch by these nets being 2,317,982 pounds, valued at $83,179. Of this amount 1,835,441 pounds, valued at $76,154, represent chinook salmon alone, the remainder being made up of

other salmon and small quantities of shad and sturgeon. The pound-net catch of this county consisted entirely of salmon. The seine catch ranked next to that of the pound nets and was made up of salmon and carp. The only carp fishery in the State during 1915 was located in this county on Willamette River Slough. The catch of carp amounted to 50,000 pounds, valued at $750, and a part of it was sent to New York. These fishes are said to be very plentiful in this section, but there is very little demand for them. Some crawfish are also taken from this slough, though this fishery has suffered a decrease during the last year or two.

Curry County.—The total catch of the fisheries of this county during 1915 was 1,086,283 pounds, valued at $63,035, this being the third county in point of importance. This position is due to the fact that Rogue River, which produces the great bulk of the catch, has both a spring and fall run of salmon. Small catches are also taken from Chetco River, but this stream is comparatively unimportant. Rogue River flows from Crater Lake in the western part of Klamath County, entirely through Jackson and Josephine Counties, and enters Curry County at the northeastern corner, flowing in a southwesterly direction through the center of the county to the ocean, and, with the exception of Columbia River, is the longest stream which we have to consider. Commercial fishing extends from the mouth up to Grants Pass, located in Josephine County. The fishermen on the lower river are handicapped because of the lack of shipping facilities and are compelled to depend entirely on vessels; the two canneries located just within the mouth of the river get practically the entire catch of the lower-river fishermen, but those fishing the upper reaches in Josephine County have access to the railroad at Grants Pass and considerable quantities go from that point in the fresh state. The catch of the county consisted entirely of salmon, all of which were taken with gill nets and seines, the gill-net catch being 660,523 pounds, valued at $38,992, and the seine catch, 425,760 pounds, valued at $24,043. The Chetco River catch usually goes to a small cannery located in northern California, as this is more accessible than the plants in Oregon. The investment in the fisheries of Curry County during the year was $111,891. In addition to canned salmon this county produced a small quantity of mild-cured chinook.

Multnomah County.—This county, with a catch of 1,165,488 pounds, valued at $62,232, ranked fourth in the value of its fisheries and presents a variety of fish exceeded only by Clatsop and Lincoln Counties, although it is located a considerable distance up Columbia River. Several fishing vessels operated by a firm located in Portland added a number of species to the list, as cod, halibut, sablefish, and rockfish, all of which were taken by lines. The chief form of apparatus used by the fishermen of this county was the gill net, with a catch of 746,724 pounds, valued at $36,577, consisting mostly of chinook salmon. The catch of crawfish, amounting to 95,000 pounds, valued at $10,735, was the next in importance. These fishes were taken in small traps similar in construction to an eelpot. The wheel fisheries of this county have been quite important in past years, though the catch was rather light in 1915; the 18 wheels owned in the county, valued at $64,800, show a catch of only 161,411 pounds, valued at $7,543.

The investment during the year was $870,944; this is exceeded only by Clatsop County, and the large amount is invested chiefly in the buildings used in the wholesale fishery trade, the cannery located on the Willamette River in Portland, and three canneries on the Columbia River side of the county. The amount invested in fishing apparatus is comparatively small. This county has quite important seine fisheries on Columbia River, but the catch in the year under consideration was negligible. One of the canneries on the Columbia packed some shad and shad roe, and some salmon was mild cured, salted, and smoked in Portland.

Tillamook County.—Although this county has three bodies of water in which commercial fisheries are prosecuted, the catch during 1915 was sufficient to give it only fifth place in the value of its fishery products as compared with other counties. The catch amounted to 2,438,177 pounds, valued at $50,216, and was made up chiefly of chinook salmon, the bulk of which were taken in gill nets. The run of chum and silver salmon was also very good in this county. Tillamook Bay is the most productive body of water in the county, having a catch of 1,191,488 pounds, valued at $24,516; this catch consisted of salmon, soft clams, and crabs, the bulk of it being salmon. Two salmon canneries are located at Bay City and one at Tillamook; a small clam cannery has recently been established at the latter place and handles practically all the clams taken at this point. There is also a mild-curing establishment at Bay City. Nehalem River is the second in importance in the county; the catch was entirely salmon and amounted to 893,630 pounds, valued at $17,492. It is practically all handled at the two canneries on the river at Wheeler and Nehalem. One plant put up a small quantity of mild-cured chinook salmon. The remaining cannery of this county is located on Nestucca River, where the catch is wholly salmon and amounted to 353,059 pounds, valued at $8,207, in 1915. The fishing on this, as well as Nehalem River, is all done with gill nets. One of the plants on the Nestucca put up a very small lot of mild-cured chinook salmon.

Although Tillamook County has six salmon canneries and one clam cannery, the investment is comparatively small, because the buildings are inexpensive, the total investment for the year being $269,938.

Wasco County.—This county, though located a considerable distance up the Columbia River, occupies a prominent position among the fishing counties of the State. It ranked sixth in the value of its fisheries and supports quite an important salmon cannery. The catch amounted to 973,475 pounds, valued at $44,757, mostly salmon, with chinooks predominating. Of this catch 838,888 pounds, valued at $40,871, which is 86 per cent of the total quantity, were taken in fish wheels, 9 of which, valued at $43,000, were operated by the fishermen of this county. In addition to salmon, the wheels took a small quantity of sturgeon. The seine fishing of this county is comparatively light and the gill-net fishing is negligible.

As previously stated, commercial fishing on the Oregon side of Columbia River does not extend above Celilo Falls, which is located in this county. Some of the fish wheels are located here, and the catch is usually very good. A considerable number of salmon are caught by the Indians, who stand on the rocks at the falls and spear

the fish en route up the river for spawning. The Indians become very expert at this work, and many of them secure a sufficient supply of fish to last them through the winter. The fish are hung in the open and cured by the simple process of drying. The preservation of fish thus cured by the Indians is generally assured, and is said to be superior to any dried fish produced by the white man. The greater part of the salmon taken by the fishermen of this county were canned, and a small lot was mild-cured. The investment of the county for the year was $139,125, the value of the cannery and the value of the wheels making up the major portion of the amount.

Clackamas County.—This county, located on Willamette River, had a catch of 397,398 pounds, valued at $26,744, during the year 1915. Although it is located quite a distance inland and supports no canneries or wholesale fish houses, it ranked seventh among the fishery counties of the State, which is due to the very extensive run of salmon in Willamette River. The greater part of the salmon are taken with gill nets, but a considerable number are taken by trolling below the falls at Oregon City. This is a comparatively recent industry, having been established only about six years ago. It is said that hundreds of small rowboats may be seen some days during the season, a considerable number of them being sportsmen coming from Portland and other points along the river for a day's outing. The law permits them to take only three fish to a man during one day, and the fish are so numerous that it is very easy to secure this number. The trolling season is in the spring, beginning early in March and continuing until early May, when the gill-net season is on. The catch, however, is negligible prior to April, and the fish do not seem to "strike" well after the first week in May. Practically no fishing is done above the falls, although some fish go over the fishway located there. The line catch is all chinook salmon. Some few silver and steelhead are found in this river in the fall, but only a very small catch of the latter is reported for the year, these being taken in gill nets. The sportsmen sometimes catch a few steelhead by line fishing in the fall. The only other species taken in this county is the crawfish; some of these are taken in Tualatin River, a small stream tributary to the Willamette River. The investment of the county for the year was $10,456. About 50 per cent of the gill-net catch is taken to Columbia River canneries by run boats, and the remainder goes to the wholesale fish trade in Portland. A considerable part of the line catch also goes to Portland.

Lincoln County.—The commercial fisheries of this county are supported by three waters, Alsea Bay, Siletz River, and Yaquina Bay. The total catch amounted to 931,931 pounds, valued at $25,496, this value giving it eighth place among the fishing counties of the State. The Alsea Bay catch was 391,562 pounds, valued at $7,346. The great bulk of this was salmon, taken in gill nets, and practically all handled at the two canneries at Lutgens and Waldport, one of which also packed some of the crabs caught here. The Siletz River catch amounted to 310,454 pounds, valued at $9,994, and consisted wholly of salmon, the greater part of which was taken with gill nets and a small portion with seines. Practically all of this salmon is handled at the cannery located at Taft, near the mouth of the river. The fisheries of Yaquina Bay region present a greater variety than the

other sections of the county. The total for this region amounted to 169,560 pounds, valued at $6,071, and, in addition to salmon, included soft clams and crabs and small quantities of flounders, herring, perch, smelt, and oysters, this being the only place in the State where the last-named five species are taken commercially. The output of oysters, which were all native, market stock, was only 221 bushels, with a value of $725. Attempts have been made to cultivate the eastern oyster in this bay, but the results were rather discouraging. The fishermen of this region are fortunate in having good shipping facilities to Portland and other inland cities, and practically the entire catch is sent out by rail.

This is one of the three counties of the State maintaining fishing vessels, although only two of these were operated in 1915, their catch consisting of halibut and "lingcod." The investment of this county amounted to $141,553.

Coos County.—The fishery products of this county during 1915 amounted to 936,445 pounds, valued at $21,408; thus it ranked ninth in the value of the catch. The bulk of this was salmon taken by gill nets, the quantity being 684,439 pounds, valued at $14,519; 189,906 pounds of salmon, valued at $3,763, were taken by seines. The fisheries of the county are located on Coos Bay and Coquille River. One salmon cannery is located on the bay at Marshfield, and, in addition to the canning, it also prepared a small quantity of mild-cured salmon. Some soft clams and crabs are also taken in this region. Several small boats from Coos Bay were engaged in ocean fishing with trawl lines for halibut, rockfishes, "lingcod," and sea bass, but this fishery was not extensive. Only gill nets and seines are used on Coquille River, and the catch was wholly salmon, which were packed at the canneries located at Prosper and Bandon, one at each place. This region is without railroad service and is therefore handicapped in regard to shipping facilities, depending entirely on vessels. The investment of Coos County during the year was $116,227.

Hood River County.—This county is located quite a distance up Columbia River, between Multnomah and Wasco Counties, and owes its importance as a fishing center to the seine fishery located at Cascade Locks. It ranked tenth among the counties in the value of the fisheries for the year; the total catch amounted to 459,046 pounds, valued at $20,311, all salmon with the exception of 1,500 pounds of sturgeon, valued at $50. The seine catch amounted to 422,046 pounds, valued at $18,501, which was nearly 92 per cent of the total catch for the county. Some gill nets are fished in this county, but this apparatus is of minor importance. This county has no canneries or fish houses, and the salmon are sold to canneries located in other counties on the river. The investment of this county for the year was $5,070.

Douglas County.—This county, although the sixth largest in the State, has less than 20 miles of coast line, but the largest river in the State, with the exception of Columbia River, is located entirely within its confines. This river, the Umpqua, is formed by the junction of the north and south forks near Roseburg and is the only water in the county furnishing commercial fishing. The entire catch was salmon, taken in gill nets, and amounted to 669,663 pounds, valued

at $12,425. Two salmon canneries were operated on the Umpqua River in 1915, one at Gardiner and the other at Reedsport, and these handled practically all the salmon taken from the river; only a few tierces being mild cured. The investment during the year was $93,444.

Washington County.—This county ranked twelfth in the value of its fisheries in 1915. The total catch was 48,420 pounds, valued at $5,474, and consisted entirely of crawfish, all of which were taken in traps fished in Tualatin River, which is a branch of the Willamette River. The traps are very similar to an eelpot; they are made of cotton twine, about 1½-inch mesh, covering a small, round iron frame. The demand for crawfish is said to have decreased considerably since the prohibition law went into effect, as most of them were handled by the saloon trade. The season is from March 1 to November 1, and the best catches are made during June and again in September and October. The crawfish buries itself in the mud during the winter. The investment in this county was only $640, the least, with one exception, in the State.

Josephine County.—This is the only county in the State not bordering on the productive waters of Columbia River or on the coast that supports commercial fisheries. It owes its place among the fishing counties to the fact that Rogue River passes entirely through it before entering Curry County. The fishing extends up as far as Grants Pass, near the eastern border of Josephine County, and a considerable part of the catch of the county is shipped by rail from that point in the fresh state. The catch was all salmon, amounted to 90,178 pounds, valued at $5,412, and was all taken in gill nets. The investment was all in gill nets and boats and amounted to $3,278.

Lane County.—This county has considerable area, but, like Douglas County, has a very short coast line, and the catch of fish is comparatively small. It was all taken from Siuslaw River and amounted to 117,526 pounds, valued at $2,530. The only form of apparatus used was gill nets. One cannery, located at Florence on the Siuslaw, handles practically all the salmon. The investment of $48,590 was mostly in the cannery building.

Yamhill County.—The output of this county was the least of all the fishing counties of the State. The product consisted entirely of crawfish, amounting to 5,300 pounds, valued at $588. All were taken from Yamhill River, tributary to the Willamette, in traps similar to those noted under Washington County. The investment for the county was only $256.

PERSONS ENGAGED, INVESTMENT, AND PRODUCTS OF THE FISHERIES OF OREGON IN 1915, BY COUNTIES.

	Clackamas.		Clatsop.		Columbia.		Coos.	
PERSONS ENGAGED.	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*
On vessels fishing			3					
On vessels transporting			34		2		4	
In shore fisheries	120		2,393		271		288	
On shore, in canneries, etc.			680		20		86	
Total	120		3,110		293		378	
INVESTMENT.								
Vessels fishing			1	$5,000				
Tonnage			18					
Outfit				300				
Vessels transporting			17	51,300	1	$4,000	2	$6,500
Tonnage			152		10		21	
Outfit				7,600		300		400
Boats:								
Gasoline			843	396,900	221	77,700	53	11,100
Sail, row, etc.	104	$3,600	220	22,695	74	18,705	119	2,875
Apparatus, vessel fisheries:								
Lines				90				
Apparatus, shore fisheries:								
Seines			43	23,500	5	1,150	8	3,025
Length in yards			21,430		1,100		2,460	
Gill nets	210	5,950	1,605	389,325	238	55,600	195	13,110
Length in yards	13,900		750,490		86,020		25,000	
Pound nets			28	19,600	8	2,300		
Hoop nets			620	905			60	90
Pots and traps	240	156	8	160	780	507		
Lines		250		1,000				120
Tongs, hoes, etc.				320				12
Shore and accessory property		500		1,020,082		7,900		56,495
Cash capital				137,800		8,000		22,500
Total		10,456		2,076,577		176,162		116,227
PRODUCTS.	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Carp					50,000	$750		
Halibut			98,000	$2,940			10,000	$1,000
Herring			2,000	120				
"Lingcod"			6,000	75			5,000	250
Rockfishes			5,000	125			6,000	300
Salmon:								
Blueback			150,447	7,522	7,577	378		
Chinook	390,420	$26,125	16,167,867	886,585	2,073,921	102,727	354,075	9,140
Chum			1,150,965	6,832	306,279	1,604		
Silver			2,391,953	47,811	67,485	1,355	511,496	8,681
Sea bass							2,000	60
Shad			446,093	4,512	32,385	331		
Steelhead trout	1,978	59	1,858,510	59,507	136,007	3,979	23,534	934
Sturgeon			75,289	3,696	7,915	397		
Tomcod			22,500	900				
Clams:								
Soft							5,140	643
Razor			77,200	10,900				
Crabs			224,900	8,430			19,200	400
Crawfish	5,000	560			30,000	3,390		
Total	397,398	26,744	22,676,724	1,039,955	2,711,569	114,911	936,445	21,408

PERSONS ENGAGED, INVESTMENT, AND PRODUCTS OF THE FISHERIES OF OREGON IN 1915, BY COUNTIES—Continued.

	Curry.		Douglas.		Hood River.		Josephine.	
PERSONS ENGAGED.	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*
On vessels transporting			2					
In shore fisheries	163		159		31		22	
On shore, in canneries, etc.	62		52		2			
Total	225		213		33		22	
INVESTMENT.								
Vessels transporting			1	$2,000				
Tonnage			7					
Outfit				400				
Boats:								
Gasoline	5	$1,700	36	9,300	4	$1,500		
Sail, row, etc.	82	2,557	75	1,875	14	1,420	22	$638
Apparatus, shore fisheries:								
Seines	6	2,900			2	600		
Length in yards	2,100				1,000			
Gill nets	159	8,680	276	13,070	23	1,550	22	2,640
Length in yards	15,310		28,140		2,720		5,500	
Shore and accessory property		68,054		51,799				
Cash capital		28,000		15,000				
Total		111,891		93,444		5,070		3,278
PRODUCTS.								
Salmon:	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Blueback					6,760	$338		
Chinook	1,021,839	$61,422	112,923	$2,265	324,780	$16,279	90,178	$5,412
Chum			5,130	40				
Silver	64,144	1,603	548,610	10,000	13,614	273		
Steelhead trout	300	10	3,000	120	112,392	3,371		
Sturgeon					1,500	50		
Total	1,086,283	63,035	669,663	12,425	459,046	20,311	90,178	5,412

PERSONS ENGAGED, INVESTMENT, AND PRODUCTS OF THE FISHERIES OF OREGON IN 1915, BY COUNTIES—Continued.

	Lane.		Lincoln.		Multnomah.		Tillamook.	
PERSONS ENGAGED.	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*
On vessels fishing	.....	.....	5	.....	15	.....	.....	.....
On vessels transporting	2	.....	.....	.....	16	.....	.....	.....
In shore fisheries	107	.....	342	.....	154	.....	339	.....
On shore, in canneries, etc.	24	.....	73	.....	168	.....	128	.....
Total	133	.....	420	.....	353	.....	467	.....
INVESTMENT.								
Vessels fishing	.....	.....	2	$3,200	2	$14,450	.....	.....
Tonnage	.....	.....	22	.....	34	.....	.....	.....
Outfit	.....	.....	.....	485	.....	2,500	.....	.....
Vessels transporting	1	$2,000	.....	.....	8	18,384	.....	.....
Tonnage	12	.....	.....	.....	65	.....	.....	.....
Outfit	.....	200	.....	.....	.....	2,950	.....	.....
Boats:								
Gasoline	16	2,400	10	4,935	110	42,750	81	$31,900
Sail, row, etc.	33	990	242	6,630	43	1,235	204	5,395
Apparatus, vessel fisheries:								
Lines	.....	.....	.....	255	.....	660	.....	.....
Apparatus, shore fisheries:								
Seines	.....	.....	4	550	2	1,500	2	1,000
Length in yards	.....	.....	640	.....	500	.....	360	.....
Gill nets	142	5,500	318	23,240	138	32,600	542	31,090
Length in yards	11,000	.....	47,530	.....	48,320	.....	59,640	.....
Pound nets	.....	.....	.....	.....	1	200	.....	.....
Pots and traps	.....	.....	1,800	1,800	1,860	1,209	240	450
Wheels	.....	.....	.....	.....	18	64,800	.....	.....
Lines	.....	.....	.....	68	.....	.....	.....	.....
Tongs, hoes, etc.	.....	.....	.....	180	.....	.....	.....	27
Shore and accessory property	.....	27,500	.....	62,710	.....	569,397	.....	149,076
Cash capital	.....	10,000	.....	37,500	.....	118,309	.....	51,000
Total	.....	48,590	.....	141,553	.....	870,944	.....	269,938
PRODUCTS.	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Cod	.....	.....	.....	.....	14,400	$288	.....	.....
Flounders	.....	.....	1,965	$40	.....	.....	.....	.....
Halibut	.....	.....	58,485	$2,056	68,684	3,434	.....	.....
Herring	.....	.....	10,500	263	.....	.....	.....	.....
"Lingcod"	.....	.....	1,870	29	.....	.....	.....	.....
Perch	.....	.....	11,930	360	.....	.....	.....	.....
Rockfishes	.....	.....	.....	.....	1,000	20	.....	.....
Sablefish	.....	.....	.....	.....	15,520	388	.....	.....
Salmon:								
Blueback	.....	.....	.....	.....	105,443	5,270	.....	.....
Chinook	33,180	$829	418,007	13,922	764,834	38,826	1,012,848	$25,247
Chum	.....	.....	52,945	268	.....	.....	466,560	2,337
Silver	83,306	1,670	250,050	4,197	3,792	78	844,414	16,891
Shad	.....	.....	.....	.....	10,147	102	.....	.....
Smelt	.....	.....	3,500	175	.....	.....	.....	.....
Steelhead trout	1,040	31	1,200	48	77,442	2,558	45,795	1,831
Sturgeon	.....	.....	.....	.....	9,226	533	.....	.....
Clams: Soft	.....	.....	760	113	.....	.....	16,560	2,285
Oysters, native, market	.....	.....	1,547	725	.....	.....	.....	.....
Crabs	.....	.....	119,172	3,300	.....	.....	52,000	1,625
Crawfish	.....	.....	.....	.....	95,000	10,735	.....	.....
Total	117,526	2,530	931,931	25,496	1,165,488	62,232	2,438,177	50.216

PERSONS ENGAGED, INVESTMENT, AND PRODUCTS OF THE FISHERIES OF OREGON IN 1915, BY COUNTIES—Continued.

	Wasco.		Washington		Yamhill		Total.	
PERSONS ENGAGED.	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*
On vessels fishing							23	
On vessels transporting							60	
In shore fisheries	69		10		4		4,472	
On shore, in canneries, etc.	50						1,345	
Total	119		10		4		5,900	
INVESTMENT.								
Vessels fishing							5	$22,650
Tonnage							74	
Outfit								3,285
Vessels transporting							30	84,184
Tonnage							267	
Outfit								11,850
Boats:								
Gasoline	3	$2,300					1,382	582,485
Sail, row, etc.	18	840	10	$250	4	$100	1,264	69,805
Apparatus, vessel fisheries:								
Lines								1,005
Apparatus, shore fisheries:								
Seines	3	900					75	35,125
Length in yards	1,500						31,090	
Gill nets	9	385					3,877	582,740
Length in yards	720						1,094,290	
Pound nets	2	600					39	22,700
Hoop nets							680	995
Pots and traps			600	390	240	156	5,768	4,828
Wheels	9	43,000					27	107,800
Lines								1,438
Tongs, hoes, etc.								539
Shore and accessory property		70,400						2,083,913
Cash capital		20,700						448,809
Total		139,125		640		256		4,064,151
PRODUCTS.	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Carp							50,000	$750
Cod							14,400	288
Flounders							1,965	40
Halibut							235,169	9,430
Herring							12,500	383
"Lingcod"							12,870	354
Perch							11,930	360
Rockfishes							12,000	445
Sablefish							15,520	388
Salmon:								
Blueback	66,800	$3,340					337,027	16,848
Chinook	732,180	36,614					23,497,052	1,225,393
Chum							1,981,879	11,081
Silver	65,980	1,581					4,844,844	94,140
Sea bass							2,000	60
Shad							488,625	4,945
Smelt							3,500	175
Steelhead trout	104,660	2,884					2,365,858	75,332
Sturgeon	3,855	338					97,785	5,014
Tomcod							22,500	900
Clams:								
Soft							22,460	3,041
Razor							77,200	10,900
Oysters, native, market							1,547	725
Crabs			48,420	$5,474	5,300	$588	415,272	13,755
Crawfish							183,720	20,747
Total	973,475	44,757	48,420	5,474	5,300	588	34,707,623	1,495,494

PRODUCTS BY APPARATUS.

In the vessel fisheries of Oregon the catch was all taken with lines, and amounted to 262,959 pounds, valued at $9,055. In the shore or boat fisheries gill nets were the most productive forms of apparatus, the catch amounting to 23,256,052 pounds, valued at $918,946. The catch with seines was 7,500,793 pounds, valued at $363,280. Pounds nets took 1,263,561 pounds, valued at $45,198; lines, 686,500 pounds, valued at $44,060; wheels, 1,000,299 pounds, valued at $48,414; tongs, hoes, etc., 101,207 pounds, valued at $14,666; pots and traps, 377,392 pounds, valued at $26,572; and hoop nets, 244,100 pounds, valued at $8,830.

The following tables give statistics by apparatus of the quantity and value of fishery products taken in the fisheries of Oregon in 1915:

YIELD OF THE VESSEL FISHERIES OF OREGON IN 1915, BY COUNTIES, SPECIES, AND APPARATUS.

Apparatus and species.	Clatsop.		Lincoln.		Multnomah.		Total.	
Lines:	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Cod					14,400	$288	14,400	$288
Halibut	98,000	$2,940	52,485	$1,756	68,684	3,434	219,169	8,130
"Lingcod"	6,000	75	1,870	29			7,870	104
Rockfishes	5,000	125			1,000	20	6,000	145
Sablefish					15,520	388	15,520	388
Total	109,000	3,140	54,355	1,785	99,604	4,130	262,959	9,055

STATISTICS OF YIELD IN THE SHORE FISHERIES OF OREGON IN 1915, BY COUNTIES, SPECIES, AND APPARATUS.

BY SEINES.

Species.	Clatsop.		Columbia.		Coos.		Curry.		Hood River.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Carp			50,000	$750						
Herring	2,000	$120								
Salmon:										
Blueback	109,645	5,483							2,760	$138
Chinook	4,609,415	264,150	98,460	4,923	60,358	$1,797	382,820	$22,968	295,780	14,789
Chum	133,573	672								
Silver	64,810	1,264	11,436	230	129,548	1,966	42,640	1,065	13,614	273
Shad	227,069	2,277								
Steelhead trout	875,531	28,695					300	10	108,392	3,251
Sturgeon	2,245	103							1,500	50
Total	6,024,288	302,764	159,896	5,903	189,906	3,763	425,760	24,043	422,046	18,501

Species.	Lincoln.		Multnomah.		Tillamook.		Wasco.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Carp									50,000	$750
Herring									2,000	120
Perch	11,930	$360							11,930	360
Salmon:										
Blueback			4,828	$241					117,233	5,862
Chinook	5,200	104	33,461	2,195	79,340	$1,973			5,564,834	312,899
Chum					5,580	30			139,153	702
Silver	1,100	22			26,829	540	50,000	$1,250	339,977	6,610
Shad			5,584	56					232,653	2,333
Steelhead trout			778	23			50,000	1,250	1,035,001	33,229
Sturgeon			3,442	172			825	90	8,012	415
Total	18,230	486	48,093	2,687	111,749	2,543	100,825	2,590	7,500,793	363,280

STATISTICS OF YIELD IN THE SHORE FISHERIES OF OREGON IN 1915, BY COUNTIES, SPECIES, AND APPARATUS—Continued.

BY GILL NETS.

Species.	Clackamas.		Clatsop.		Columbia.		Coos.		Curry.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value*	*Pounds.*	*Value.*
Salmon:										
Blueback			39,117	$1,954	7,577	$378				
Chinook	322,920	$19,375	10,387,488	558,001	1,835,441	76,154	278,957	$6,974	639,019	$38,454
Chum			865,922	5,028	265,304	1,336				
Silver			2,237,709	44,731	40,061	805	381,948	6,712	21,504	538
Shad			158,805	1,627	32,385	331				
Steelhead trout	1,978	59	845,274	26,119	129,299	3,778	23,534	833		
Sturgeon			72,869	3,581	7,915	397				
Total	324,898	19,434	14,607,184	641,041	2,317,982	83,179	684,439	14,519	660,523	38,992

Species.	Douglas.		Hood River.		Josephine.		Lane.		Lincoln.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Flounders									1,965	$40
Herring									10,500	263
Salmon:										
Blueback			4,000	$200						
Chinook	112,923	$2,265	29,000	1,490	90,178	$5,412	33,180	$829	412,807	13,818
Chum	5,130	40							52,945	268
Silver	548,610	10,000					83,306	1,670	248,950	4,175
Smelt									3,500	175
Steelhead trout	3,000	120	4,000	120			1,040	31	1,200	48
Total	669,663	12,425	37,000	1,810	90,178	5,412	117,526	2,530	731,867	18,787

Species.	Multnomah.		Tillamook.		Wasco.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Flounders							1,965	$40
Herring							10,500	263
Salmon:								
Blueback	36,784	$1,837			800	$40	88,278	4,409
Chinook	665,800	33,250	933,508	$23,274	4,600	235	15,745,821	779,531
Chum			460,980	2,307			1,650,281	8,979
Silver			817,585	16,351	1,600	43	4,381,273	85,025
Shad	3,500	35					194,690	1,993
Smelt							3,500	175
Steelhead trout	37,310	1,280	45,795	1,831	1,500	40	1,093,960	34,259
Sturgeon	3,300	175			1,700	119	85,784	4,272
Total	746,724	36,577	2,257,868	43,763	10,200	477	23,256,052	918,946

BY POUND NETS.

Species.	Clatsop.		Columbia.		Multnomah.		Wasco.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Salmon:										
Blueback	1,685	$85							1,685	$85
Chinook	580,964	29,034	140,020	$5,650	7,300	$365	8,320	$416	736,604	35,465
Chum	151,470	1,132	40,975	268					192,445	1,400
Silver	89,434	1,816	15,988	320	2,892	60	7,132	143	115,446	2,339
Shad	60,219	608							60,219	608
Steelhead trout	137,705	4,693	6,708	201	4,464	135	7,680	230	156,557	5,259
Sturgeon	175	12					430	30	605	42
Total	1,021,652	37,380	203,691	6,439	14,656	560	23,562	819	1,263,561	45,198

BY HOOP NETS.

Species.	Clatsop.		Coos.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Crabs	224,900	$8,430	19,200	$400	244,100	$8,830

STATISTICS OF YIELD IN THE SHORE FISHERIES OF OREGON IN 1915, BY COUNTIES, SPECIES, AND APPARATUS—Continued.

BY POTS AND TRAPS.

Species.	Clackamas.		Clatsop.		Columbia.		Lincoln.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Crabs							119,172	$3,300
Crawfish	5,000	$560			30,000	$3,390		
Tomcod			22,500	$900				
Total	5,000	560	22,500	900	30,000	3,390	119,172	3,300

Species.	Multnomah.		Tillamook.		Washington.		Yamhill.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Crabs			52,000	$1,625					171,172	$4,925
Crawfish	95,000	$10,735			48,420	$5,474	5,300	$588	183,720	20,747
Tomcod									22,500	900
Total	95,000	10,735	52,000	1,625	48,420	5,474	5,300	588	377,392	26,572

BY WHEELS.

Species.	Multnomah.		Wasco.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Salmon:						
Blueback	63,831	$3,192	66,000	$3,300	129,831	$6,492
Chinook	58,273	3,016	719,260	35,963	777,533	38,979
Silver	900	18	7,248	145	8,148	163
Shad	1,063	11			1,063	11
Steelhead trout	34,860	1,120	45,480	1,364	80,340	2,484
Sturgeon	2,484	186	900	99	3,384	285
Total	161,411	7,543	838,888	40,871	1,000,299	48,414

BY LINES.

Species.	Clackamas.		Clatsop.		Coos.		Lincoln.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Halibut					10,000	$1,000	6,000	$300	16,000	$1,300
"Lingcod"					5,000	250			5,000	250
Rockfishes					6,000	300			6,000	300
Salmon: Chinook	67,500	$6,750	590,000	$35,400					657,500	42,150
Sea bass					2,000	60			2,000	60
Total	67,500	6,750	590,000	35,400	23,000	1,610	6,000	300	686,500	44,060

BY TONGS, HOES, ETC.

Species.	Clatsop.		Coos.		Lincoln.		Tillamook.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Clams:										
Razor	77,200	$10,900							77,200	$10,900
Soft			5,140	$643	760	$113	16,560	$2,285	22,460	3,041
Oysters, native, market					1,547	725			1,547	725
Total	77,200	10,900	5,140	643	2,307	838	16,560	2,285	101,207	14,666

FISHERY INDUSTRIES.

For statistics of the quantity and value of fishery products prepared in Oregon in 1915, exclusive of canning, see table, page 54. The following table contains statistics of the extent of the canning industry of the State, by districts, in 1915:

EXTENT OF THE CANNING INDUSTRY OF OREGON IN 1915, BY DISTRICTS.

Items	Columbia River.		Pacific coast.		Total.	
	Number.	Value.	Number.	Value.	Number.	Value.
Establishments	10	$772,235	24	$336,131	34	$1,108,366
Cash capital	.....	180,309	.....	175,300	.....	355,609
Persons engaged	561	.....	467	.....	1,028	.....
Wages paid	.....	283,609	.....	91,830	.....	375,439
PRODUCTS.[a]						
Salmon:						
Blueback—						
1 pound, flat....cases..	11	88	.....	.....	11	88
½ pound, flat....do....	4,499	24,827	.....	.....	4,499	24,827
Chinook—						
1 pound, tall....do....	23,828	155,185	9,908	47,654	33,736	202,839
1 pound, flat....do....	103,108	801,122	18,749	139,289	121,857	940,411
1 pound, oval....do....	2,388	21,496	.....	.....	2,388	21,496
½ pound, flat....do....	125,296	1,024,727	7,959	52,514	133,255	1,077,241
¼ pound, flat....do....	1,529	4,578	.....	.....	1,529	4,578
Chum—						
1 pound, tall....do....	25,158	66,122	8,991	23,170	34,149	89,292
1 pound, flat....do....	2,291	6,558	.....	.....	2,291	6,558
½ pound, flat....do....	4,288	8,848	.....	.....	4,288	8,848
Silver—						
1 pound, tall....do....	11,332	78,530	23,170	101,229	34,502	179,759
1 pound, flat....do....	2,093	14,160	3,949	18,059	6,042	32,219
½ pound, flat....do....	8,652	27,490	4,209	18,570	12,861	46,060
Steelhead—						
1 pound, tall....do....	3,955	20,791	.....	.....	3,955	20,791
1 pound, flat....do....	8,710	56,682	.....	.....	8,710	56,682
½ pound, flat....do....	6,118	35,127	.....	.....	6,118	35,127
Shad:						
1 pound, tall....do....	1,281	3,184	.....	.....	1,281	3,184
½ pound, flat....do....	1,145	3,435	.....	.....	1,145	3,435
Shad roe:						
½ pound, flat....do....	171	1,702	.....	.....	171	1,702
½ pound, oval....do....	93	1,153	.....	.....	93	1,153
Clams:						
No. 1, whole....do....	.....	.....	400	1,760	400	1,760
No. 1, minced....do....	.....	.....	4,574	20,145	4,574	20,145
No. 2, minced....do....	.....	.....	1,320	5,134	1,320	5,134
Halves, minced....do....	.....	.....	3,248	12,660	3,248	12,660
Clam juice: No. 1....do....	.....	.....	225	810	225	810
Crabs: ½ pound, flat....do....	.....	.....	252	3,169	252	3,169

[a] All products except clams and clam juice, which have no uniform weight, represent 48 pounds to the case.

FISHERIES OF CALIFORNIA.

California in 1915 ranked second among the Pacific Coast States in the number of persons engaged, in the value of its investment, and in the amount and value of its fishery products. There were 4,282 persons engaged in the shore fisheries, 551 in the vessel fisheries, 35 in vessels transporting, and 3,584 persons engaged on shore in canneries, etc., making a total of 8,452 persons connected with the fisheries, as compared with 5,530 in 1904. The increase can be traced mainly to the shore industries.

The total investment in the fisheries of the State amounted to $5,824,263, showing an increase of nearly 55 per cent since 1904. The items making up this total are 73 fishing vessels valued, with

their outfit, at $354,375; 20 transporting vessels with a value, including their outfit, of $72,000; 1,429 gasoline boats valued at $1,351,110; 1,169 other boats valued at $104,816; apparatus, in the shore and vessel fisheries, valued at $606,944; shore and accessory property with a value of $2,731,390 and working cash capital amounting to $448,809.

The products of the fisheries of California in 1915 aggregated 93,338,703 pounds, with a value to the fishermen of $2,506,702. This is an increase of about 44 per cent in quantity, but a decrease of about three-fifths of 1 per cent in value as compared with 1904. Among the items in the products of special importance may be mentioned 7,303,933 pounds of chinook salmon, valued at $340,949; 21,024,190 pounds of albacore, or tuna, valued at $316,103; 6,923,563 pounds of flounders, valued at $209,766; 375,774 pounds, or 53,682 bushels, of eastern oysters, valued at $165,573; 4,952,692 pounds of salted cod, valued at $161,695; 1,784,488 pounds of striped bass, valued at $146,928; 4,344,254 pounds of rockfishes, valued at $146,216; 892,392 pounds of spiny lobsters, valued at $130,119; 1,414,155 pounds of crabs, valued at $128,434; 3,592,646 pounds of barracuda, valued at $124,870, and 5,761,929 pounds of sole, valued at $108,254.

For statistics as to number of persons engaged, investment, and products of the fisheries of California in 1915, see table, page 51.

FISHERIES BY COUNTIES.

San Francisco County.—The fisheries of San Francisco County in 1915 were more valuable than those of any other county in the State, the output amounting to 17,602,489 pounds, valued at $649,864. Among the leading species were codfish, eastern oysters, crabs, sole, rockfishes, flounders, striped bass, and chinook salmon. The codfish, amounting to 4,952,692 pounds, valued at $161,695, were taken by three vessels owned in San Francisco and fishing in Alaskan waters. Practically all of the fishermen of this county live within the corporate limits of San Francisco. In 1915, 552 men were engaged in the shore fisheries and 116 on vessels of 5 net tons and over. A majority of the fishermen, as well as wholesale dealers, are Italians. There were 290 gas boats, valued at $259,710; 35 rowboats, valued at $705; 68 house boats and scows, valued at $7,600; and 2 sailboats, valued at $500, employed in the fisheries of this county. Practically all of these boats were docked at Fishermens Wharf, San Francisco, the headquarters of the several fishery unions to which the owners of the boats belonged.

The fishing from San Francisco is prosecuted both in the ocean and in San Francisco Bay. The trawl-line fishing for rockfishes and other species and the hoop-net fishing for crabs are followed entirely in the ocean, while the gill nets are fished both in the ocean and San Francisco Bay, and occasionally fishermen go as far as Suisun Bay. The leading species taken with this apparatus are sea bass, smelt, shad, chinook salmon, herring and carp. Seines are also fished in San Francisco Bay for white bait, anchovies, and sardines. Among other forms of apparatus used are lampara nets and bag nets, the catch consisting mainly of squid and shrimp. The shrimp are taken mainly by Chinese fishermen.

San Francisco is the headquarters of an important oyster fishery prosecuted in San Francisco Bay. This industry, however, has suffered a noticeable decline within recent years. In 1904, the output amounted to 138,667 bushels of eastern oysters, valued at $514,399, and 42,932 bushels of native oysters, valued at $91,770. In 1915 the output had dwindled to 51,556 bushels of eastern oysters, valued at $156,745. No native oysters have been taken from San Francisco Bay for several years, the result being that most of those now consumed have to be brought from Washington, the price being very much greater than formerly, when there was a local supply.

A small quantity of soft clams are taken from the flats of San Francisco Bay near San Francisco by fishermen from that city. In 1915 the output was 2,300 bushels, with a value of $5,300, a decline of 914 bushels since 1904, but an increase in value of $1,550. The clams are handled mostly by Chinese dealers, and many of the fishermen are also Chinese.

Mussels to the amount of 600 bushels, with a value of $1,200, were scraped from the pilings of the city wharves and disposed of for food.

Contra Costa County.—The fishery products of this county in 1915 amounted to 7,395,328 pounds, valued at $229,550. The most important species were chinook salmon, striped bass, and shad. A few other species were taken in small quantities. Most of the fishing was done in Suisun and San Pablo Bays and the Sacramento River. A little fishing was also done in San Francisco Bay and San Joaquin River. With the exception of a few seines used mainly for carp and smelt, gill nets are the only apparatus used in this county. Pittsburg is the most important fishing center, not only in this county, but on the entire Sacramento River. In 1915 a total of 305 fishermen and 5 shoremen were engaged in this town, almost all of whom were Italians. These men employed 100 sailboats, valued at $13,000; 51 gas boats, valued at $29,000; and 8 house boats, worth $1,600. Gill nets were the only form of apparatus used. This town in 1915 was the center of an important canning trade in shad, shad roe, and chinook salmon. In addition, immense quantities of shad were salted and mild cured, and large supplies of chinook salmon were mild cured and pickled. Most of the salted shad were sent to China. During this year the first shipments east of shad in large quantities were begun. They were sent by express in refrigerator cars. The consignments were made in carload lots, and were sent mostly to Chicago and New York. The first large shipments of shad to the east were made in 1914.

One-half or more of the fishermen of this town yearly make a practice of going to Alaska to fish under contract for one of the salmon-canning firms of that territory. They usually leave Pittsburg between April 1 and 15 and remain away about five months. The trip is made on one of the companies' steamers from San Francisco.

Martinez, also in Contra Costa County, has very important gill-net fisheries, the catch in 1915 amounting to 672,000 pounds of striped bass, valued at $57,120; 414,000 pounds of chinook salmon, valued at $21,390; and 153,355 pounds of shad, valued at $2,300. A total of 105 men were engaged in fishing and 7 in transporting fish. These men employed 22 gas boats, valued at $10,200; 34

sailboats, valued at $5,000; and 7 house boats, worth $1,400. A branch of a firm in Pittsburg salted large quantities of shad here.

Solano County.—There are several important fishing localities in this county, the most important of which is Rio Vista. The greater part of the fishing is done in the Sacramento River, but a considerable amount is also done in San Pablo and Suisun Bays and San Joaquin River. The catch consists mainly of chinook salmon and striped bass. Large quantities of shad are taken, but the price is too low to afford much profit. Gill nets are the only form of apparatus used in the county. One cannery at Benicia and a mild-curing establishment at South Vallejo utilized large quantities of chinook salmon. Most of the catch, however, as in Contra Costa County, was handled by local buy boats working on commission for San Francisco firms.

Marin County.—Considering the extent of its fisheries as compared with some of the more important counties, the variety of fishery products in this county is rather noticeable. The greater part of the fishing is done in Tomales Bay, but some of the fishermen along that bay also fish in the ocean. Many kinds of apparatus are used, but the most important forms are seines and gill nets. The leading species taken with seines are surf fish, herring, and perch, and with gill nets sea bass, smelt, and striped bass. Considerable quantities of clams are taken in Tomales Bay, but the industry is far less important than that of the oyster, which has been developing to some extent during the past few years through private planting. The cultivation of clams on private beds has also been undertaken recently. As Tomales Bay is comparatively free from impurities, it is thought that both the oyster and clam industries should improve with attention. A few men were engaged for a short time in 1915 in taking abalone, the resultant products consisting of $450 worth of shells, $158 worth of abalone meat, and $40 worth of pearls.

Sausalito is situated on Richardson Bay, but its leading fishery industry is that for crabs, conducted in the Pacific Ocean. The output in 1915 amounted to 163,800 pounds, valued at $16,134.

San Joaquin County.—The total output of the fisheries of this county in 1915 amounted to 1,330,674 pounds, valued at $44,236, showing an increase since 1904 of 803,853 pounds in quantity and $21,960 in value. Catfish was the leading species, two-thirds of the State's catch being credited to this county. They were taken in the San Joaquin River in fyke nets and seines, but mainly in the former. Next in importance to the catfish is the chinook salmon. Shad exceed all other species in abundance, but its importance is much lessened by the low price received by the fishermen. More than one and a quarter million pounds of this species were salted at different points in the county during the year, many of the fish coming from points outside of the county. Of the firms engaged in salting, one was American and the other two Chinese. Practically all of the salted shad were shipped to China. Stockton is the center of the wholesale trade of the county.

Humboldt County.—The output of the fisheries of this county in 1915 amounted to 829,630 pounds, valued at $32,796, more than one-half of the value being credited to chinook salmon. Among other species worthy of mention are silver salmon, flounders, smelt, steelhead trout, soft clams, and crabs. This county borders on the Pacific Ocean,

but its most important fisheries are those prosecuted in the Eel River. The output of this river in 1915 amounted to 558,893 pounds, valued at $22,246, which was less than one-fourth of the catch made in 1904. Chinook salmon constituted 80 per cent of the catch, the remainder consisting of silver salmon, steelhead, and sturgeon. The catch was handled by local buyers and shipped mainly to San Francisco. Eureka is the center of the county's wholesale trade, two firms located there handling most of the fish taken in Humboldt Bay and the Pacific Ocean. Besides those taken in Eel River some salmon are also taken in Mad River and Redwood Creek. Several men follow clamming in Humboldt Bay at times during the year, the catch being disposed of locally in Eureka. Crab nets are set both in Humboldt Bay and the Pacific Ocean. The catch would probably be greater than at present if it were not that the law prohibits the shipping of crabs out of the county. Some trawl-line fishing is followed from Eureka in the Pacific Ocean, the catch consisting mainly of flounders and rockfishes.

Sacramento County.—This county is situated entirely on the Sacramento River. The total catch in 1915 amounted to 447,167 pounds, valued at $23,132, which was less than one-half of the catch shown for 1904. Nearly 45 per cent of the catch consisted of chinook salmon. The catfish ranks as one of the important species of the county. Gill nets and fyke nets are the only kinds of apparatus used. Sacramento is the most important fishing center in the county. In 1915 three wholesale firms, one of them Chinese, located in this city, together with one in Yolo County across from Sacramento, handled large quantities of fresh fish taken in the vicinity and from a long distance up the river. While many of these fish were shipped to States to the eastward, the major portion probably reached San Francisco. The fishery resources of the Sacramento River are much greater below than above Sacramento. A Chinese firm opposite Antioch salted a large quantity of shad during the year, the product being shipped to China. The European war caused a discontinuation of this work.

Alameda County.—This county is situated on San Francisco Bay, in which waters most of its fishing is done. The total output in 1915 amounted to 1,092,180 pounds, valued at $22,598, as compared with 116,958 pounds, valued at $29,804 in 1904. The noticeable increase in quantity in 1915 was due to a large catch of stingray and shark, disposed of to a nearby plant manufacturing poultry feed and oil. Owing to the low price received, these two species did not add materially to the total value of products. The decrease in value of products since 1904 can be traced mainly to the decline of the oyster industry. Both the clam and shrimp industries are of importance in this county. There are several wholesale firms in Oakland, but most of the fish handled by them were brought from San Francisco and more distant points. One firm of Chinese handled clams only.

Del Norte County.—This is the most northern of the coastal counties of California. Requa, though a mere village, is the leading fishing center of the county, owing its importance in this particular to the location there of a salmon cannery, which handles most of the fish taken in the Klamath River, on which the village is located. A salmon cannery at Smith River, on the river of that name, utilizes practically all of the salmon from that stream. The total output of Del Norte County in 1915 amounted to 924,135 pounds, valued

at $21,912, consisting mostly of chinook and silver salmon. At Crescent City, situated on the Pacific Ocean, some fishing for crabs was followed, most of the men belonging in San Francisco. The output of salmon since 1904 shows a noticeable increase for the county. The lack of railroads in the county, however, serves as a bar to any great extension of the fishery industries.

Tehama County.—The fishing in this vicinity is done entirely in the Sacramento River, the latter flowing through the central part of the county. Aside from a couple of drift gill nets at Corning, seines are the only form of apparatus used. The total output of the county in 1915 was 186,839 pounds, valued at $13,221, as compared with 176,079 pounds, valued at $7,003 in 1904. The fishing is followed entirely for chinook salmon, a few other species, such as striped bass, catfish, shad, and sturgeon, being taken incidentally.

Mendocino County.—The fishing in this county is centered mainly at Fort Bragg, the only coast town of the county situated on a railroad. The output of the county in 1915 amounted to 185,535 pounds, valued at $10,512. No returns are shown for this county in 1904, as the railroad to Fort Bragg had not then been constructed. The leading species are chinook and silver salmon, rockfishes, and flounders. Some abalone and mussels are also taken. Trolling is followed to a considerable extent in the ocean off Fort Bragg from June to the middle of September, men from other counties also engaging in the fishery. Some trawl-line fishing for rockfishes, flounders, and "lingcod" is followed in the ocean during March, April, and May whenever the weather permits the men to get out. During the fall and winter of 1915 some silver salmon were taken with gill nets in a few of the small rivers of the county, but net fishing was prohibited in these streams after that year.

Yolo County.—The decline in the fisheries of this county between 1904 and 1915 was from 341,500 pounds, valued at $12,030, to 249,553 pounds, valued at $10,448, showing a greater proportionate decline in quantity than in value. Considerably more than one-half the catch was made with drift gill nets and the remainder with fyke nets and seines. The most important species are chinook salmon, catfish, shad, hardhead, and striped bass. The first-named species made up about 45 per cent of the value of the entire catch. Broderick, across the Sacramento River from Sacramento, is the most important fishing locality in the county. One wholesale firm located there buys a considerable proportion of the catch, the remainder being sold to dealers in Sacramento.

Sonoma County.—There is a greater variety of fishing at Bodeja than at any locality in the county, several different forms of apparatus being used. Among the important products taken in the county are abalone, including pearls and blisters, surf fish, rockfishes, chinook salmon, soft clams, crabs, perch, hard clams, and crawfish, the last named being taken in the Russian River several miles above its mouth. The total output of the county in 1915 amounted to 243,150 pounds, valued at $9,325. No fishing was reported in this county in 1904. Lack of railroad facilities to the coast probably accounts for the slow growth of the fisheries of the county.

Butte County.—The output of this county in 1915 amounted to 82,800 pounds, valued at $6,720, or less than one-half in quantity and

slightly over 75 per cent in value of the catch shown for 1904. Seines were the only form of apparatus used. Aside from a few hundred pounds of striped bass and sturgeon the catch was confined to chinook salmon. Most of the catch was shipped from Chico.

Glenn County.—The total fishery output of this county in 1915 amounted to 86,100 pounds, having a value of $6,705. No catch was shown for this county in 1904. Willow is the most important fishing center in the county. Aside from a few chinook taken with drift gill nets the entire catch was taken with seines. Chinook salmon constituted about 94 per cent of the catch, the remainder consisting of sturgeon and striped bass.

Colusa County.—With the exception of a few fykes and hand lines, seines were the only form of apparatus used in the county. The output in 1915 amounted to 58,456 pounds, valued at $4,214. Several species were taken, but chinook salmon constituted about three-fourths of the catch. Colusa, the county seat, is the most important fishing center. No fisheries were shown for this county for 1904.

Sutter County.—The fishery resources of this county show a decline from 148,000 pounds, valued at $6,440, in 1904, to 73,645 pounds, valued at $2,921, in 1915. In 1904 the catch consisted largely of chinook salmon, but in 1915 nearly 70 per cent of the catch was catfish. Most of the fishing is confined to the southern part of the county, from Knights Landing down, and is sold to dealers in Sacramento and Broderick.

San Mateo County.—The output of this county in 1915 amounted to 26,500 pounds, valued at $1,910, as compared with 216,140 pounds, valued at $6,405, in 1904. This difference is due mainly to the decline of the shrimp industry through restrictive legislation. The output consisted of soft clams, crabs, rockfishes, and a few smelt. Aside from a small local consumption, the entire catch was landed and sold in San Francisco, which is not far distant from the fishing grounds of the county.

Shasta County.—This county is the uppermost one on the Sacramento River in which commercial fishing is prosecuted. The output in 1915 amounted to 20,997 pounds, valued at $1,289, which is about one-half of the value of the output in 1904. Aside from a few fish taken with spears, the catch is credited entirely to seines. Chinook salmon and a few striped bass were the only species taken. Cottonwood and Anderson were the principal fishing localities. As in the case of most of the counties on the Sacramento River above Sacramento, the fish are shipped mainly to Sacramento and San Francisco. A few are shipped by the buyers north to Seattle and Portland and to neighboring States eastward. Owing to the current, seines are best adapted for the fisheries of the Sacramento River above Yolo County, and in most instances a horse is necessary in hauling the seine. A law passed by the California legislature in 1916 prohibits all fishing in the Sacramento River above Vina, Tehama County. Previously there was no limit to the fishing in the river.

Los Angeles County.—This is the most thickly settled county in the State and far exceeded any other in the number of persons employed, the amount of capital invested in the fisheries, and the quantity of fishery products taken during the year 1915, but the value of the products was less than in San Francisco County. There were 2,428 persons engaged either as active fishermen or in the various

fishery industries on shore; the value of shore property, fishing apparatus, boats, etc., was $2,041,401; and the products amounted to 27,420,247 pounds, valued at $515,863. Including some chinook, chum, and silver salmon taken from Columbia River by a vessel from San Pedro, there were 33 species.

The fisheries are centered in the southern part of the county, in Los Angeles Harbor at San Pedro, East San Pedro, and Wilmington, and at Long Beach.

Some fishing is also done from Redonda Beach, Santa Monica, and Venice, and a little from Catalina Island, although the greater part of that done at the last-named place is for sport. The present importance of the county as a fishing center is due to the rapid growth of the tuna industry during recent years, although it has occupied a prominent place among the fishing counties of the State for a number of years because of the quantity of barracuda, flounders, rockfishes, and other species taken. The bulk of the tuna is sold to the canneries, though at times some go to the wholesale dealers, who handle the other species, shipping them to various inland points.

During the year 1915 there were 10 wholesale fresh-fish houses and 1 tuna cannery at San Pedro, 3 tuna canneries at East San Pedro, 1 at Wilmington, and 5 at Long Beach. There were also a number of wholesale fresh-fish dealers at Los Angeles. A large percentage of the fishermen are Austrians, some Americans, and, in the tuna fishery especially, many are Japanese.

Of the total catch 17,367,259 pounds, or nearly 63 per cent, were albacore or tuna, valued at $260,667. Other important catches were barracuda, 1,555,162 pounds, valued at $59,256; flounders, 1,349,103 pounds, valued at $51,731; rockfishes, 690,131 pounds, valued at $21,882; yellowtail, 679,868 pounds, valued at $18,976; sea bass, 446,064 pounds, valued at $16,953, and bonito, 370,844 pounds, valued at $10,840.

Owing to the fact that the large catch of albacore is practically all taken by lines, these are by far the most important form of apparatus. The total catch of all species by lines was 18,518,522 pounds, valued at $300,417, of which 17,339,499 pounds, valued at $260,223, were albacore. Other important species in the line fishery are the rockfishes, amounting to 690,131 pounds, valued at $21,882.

The gill-net catch ranked next to that of the lines, amounting to 1,911,649 pounds, valued at $66,996, of which 893,960 pounds, valued at $34,738, were barracuda. Considerable quantities of bonito, sea bass, and yellowtail were also taken by the gill nets. The lampara net also occupies a prominent place in the fisheries of the county, the catch amounting to 1,745,777 pounds, valued at $52,935, consisting chiefly of yellowtail and barracuda. The trammel net was next in importance, with a catch of 1,069,496 pounds, valued at $40,454, mostly flounders, known locally as "California halibut." There has been quite an increase in the number of small fishing vessels hailing from Los Angeles County. During the year there were 38 of these of 5 tons net or more, with a total net tonnage of 343 and a value of $85,700, the majority being engaged in line fishing for albacore. The only seines fished from the county were purse seines, operated from six of these vessels, the catch consisting chiefly of barracuda and yellowtail, with some bonito, mackerel, sea bass, Spanish mackerel, and albacore. The gill-net catch of the vessel fisheries was chiefly barracuda, and the trammel nets took only flounders.

The kelp, which grows in abundance along the Pacific coast, has not been utilized commercially in the past, though it has long been known to contain a large percentage of potash. This country has heretofore depended almost entirely on Germany for its supply of potash, but since the beginning of the European war there has been such a decrease in the importation of this product that the Department of Agriculture deemed it expedient to make investigations to determine the feasibility of harvesting the kelp for the purpose of extracting the potash and other ingredients of commercial value. It was found to be entirely practicable and, though the actual work was yet in its incipiency in 1915, extensive preparations were being made in Los Angeles and San Diego Counties for future effort in this important industry, and a number of plants were in operation in 1916. One company operated in Los Angeles County during 1915 and cut 1,500 tons of kelp.

San Diego County.—This county ranked fourth in the State in the quantity of products taken during the year. The total catch was 12,652,996 pounds, valued at $343,919. In the amount of the capital invested, which was $625,021, and the number of persons employed, which was 1,026, it occupied third place. The products included 21 different species, and a number of these were sold both fresh and salted. As in Los Angeles County, the leading species was albacore, with a total catch of 3,630,931 pounds, valued at $54,505, used fresh, and 25,000 pounds, valued at $481, salted. Other species taken in large quantities were flounders, 2,182,658 pounds, valued at $83,826; barracuda, fresh, 1,415,904 pounds, valued at $41,121, and salted, 330,000 pounds, valued at $13,180; rockfishes, 734,464 pounds, valued at $16,703; spiny lobsters, 500,313 pounds, valued at $84,726; rock bass, fresh, 489,450 pounds, valued at $10,032, and salted, 2,750 pounds, valued at $97; yellowtail, fresh, 337,898 pounds, valued at $4,954, and salted, 124,500 pounds, valued at $4,743.

The fisheries of this county are centered at San Diego, where four tuna canneries, one of which also canned a small lot of abalone taken from Mexican waters, and six wholesale fresh-fish houses are located. The abalone canning was somewhat in the nature of an experiment and was discontinued when found to be unprofitable because of the excessive cost of getting abalone from foreign waters.

Many of the fishermen of southern California have been going to Mexican waters during the last eight years or more because they thought those waters more productive than those where they had been fishing nearer their home ports. To do this, they are required to secure a permit from the representatives of the government of Lower California and also to pay a tax of 2 cents per pound on all fish taken from what are claimed as Mexican waters, and it has been stated that this tax is levied even though the fish in question have been taken beyond the 3-mile limit. The bulk of the halibut or flounders and a considerable portion of the barracuda, lobsters, and other species brought to the San Diego market are from fishing grounds off Lower California. It is said that some of the San Diego boats often go as far as 100 miles or more from home when fishing in southern waters.

Line fishing is the most important, because the great bulk of the albacore is taken by that apparatus. The total catch by lines was 5,580,946 pounds, valued at $101,381, of which 3,628,560 pounds,

valued at $54,429, were albacore, the greater part of the remainder consisting of rockfishes, rock bass, and yellowtail.

The rockfish fishery is one of the most important in this county, as well as in Los Angeles County, the catch being all by lines and especially good. A great deal of the fishing is done about San Clemente Island, located 65 or 70 miles off San Diego. The rockfishes are often taken in 100 fathoms or more of water. The season for fishing is mostly in winter, though the fish may be found in these waters practically the entire year. It is said to be almost impossible to work the gear during summer because of the presence of the sharks which do considerable damage to the lines. Either a "hand line" or "set line" is used. The former has about 125 hooks, which are attached to snoods hung from the main line at intervals of about 9 inches. The line is laid out on the bottom with a stone made fast to one end, and to the other end is attached a line which extends up to the boat. The crew usually consists of three men, and one man is assigned to tend a single line. The main line is No. 156 hard-laid cotton, and the snoods are No. 24 cotton twine. If the fish are not biting readily, the lines are sometimes buoyed, and the men move about in search of more productive grounds.

The set lines are much more extensive and are made of a number of lengths of 200 hooks each, tied together to make one string. Sometimes as many as 15 to 20 of these pieces are fished as one line. The line is weighted at each end with a stone or piece of iron, and a buoy line attached. When fishing a bottom that is especially rocky, or when the water is rough, additional buoys are attached between the end ones to prevent the line becoming entangled. The main line is No. 240 hard-laid cotton, and the snoods are No. 24 cotton twine. The snoods are about 3½ feet long and are attached to the main line at intervals of from 5 to 5½ feet. The buoy lines are manila. It is often difficult to raise these set lines, especially if the water is rough, and it sometimes requires the combined effort of two or three men to accomplish this. The bait for the lines is sardines or fish cuttings. These lines are practically the same as those used in the other counties of southern California.

The lobster pots ranked next to the lines in importance. The catch, which consisted entirely of spiny lobsters, amounted to 500,313 pounds, valued at $84,726. Spiny lobsters are not taken north of Santa Barbara County, but are found in considerable numbers from that county southward. The State law prohibits fishing for them in California waters during the summer when they are spawning, but there seems to be no State prohibition against the importation of the Mexican lobster during that period, and as a result of this lack of restriction many of the fishermen from San Diego have been going to the coast of Lower California during recent years, establishing camps for the summer season, and sending great quantities of lobsters to the California market. Many are opposed to this practice, because they are of the opinion that the lobster should be protected when spawning in Mexican waters as well as in California, and are anxious to have legislation to prohibit importing them during the closed season. The best lobster-fishing grounds in the early fall are on the kelp beds near the shore, where the lobsters seem to gather for protection, but as cold weather advances they go out to deeper water. It is often very difficult to raise the pots because of the heavy swell, and at times the men

have to attach the buoy line to the moving boat in order to get them up. The pots are made of laths and are mostly about 3 feet long, 30 to 32 inches wide at the bottom, narrowing to about 12 inches at the top, and are 12 inches high. They are set singly with a buoy line attached to each pot in water varying in depth from 3 to 20 fathoms. When fishing in deep water, it is often necessary to use 40 to 60 pounds of ballast to a single pot.

The trammel-net fishery is also quite important. The catch consisted entirely of flounders and amounted to 2,182,408 pounds, valued at $83,816. Trammel nets are made very much on the plan of a gill net, though they have three webs instead of one. A web of small-mesh netting is hung between two webs of larger mesh, the middle one hanging deeper than the two outside ones, so that the fish striking from either side and forcing the small mesh net through the larger mesh forms a bag from which it is impossible to escape. The two outside webs are 23-inch mesh, No. 12 cotton twine, and about 12 feet deep, and the center one is 9-inch mesh, No. 9 cotton twine, and about 16 feet deep. One net is 36 to 40 fathoms long, and a number are usually tied in a string and fished as one net, sometimes as many as 20 being used to one string.

The gill net ranks next in importance. The catch amounted to 2,260,329 pounds, valued at $68,388. This net is used chiefly for fishing barracuda, and over 69 per cent of the total catch consisted of that species, the number of pounds being, fresh, 1,362,441, valued at $39,957, and salted, 198,000 pounds, valued at $7,900. Sea bass and yellowtail also figure quite prominently in the gill-net catch, the former amounting to 261,703 pounds, valued at $8,351, and the latter to 212,645 pounds, fresh, valued at $3,389, and 55,500 pounds, salted, valued at $1,983.

The quantity of kelp harvested during 1915 was about 1,000 tons, valued at $1,000.

The fishing vessels of 5 tons net or more hailing from San Diego County numbered 13, with a total net tonnage of 112 tons and a total value of $34,550. Several of these are from La Playa, located on San Diego Bay opposite San Diego, and are fished by Portuguese, who fish mostly in Mexican waters and sometimes go several hundred miles from their home port. The greater part of their catch is salted in the hold of the vessel and consists chiefly of barracuda, jewfish, Spanish mackerel, and rockfishes. Other vessels take considerable quantities of albacore.

Monterey County.—The products of the fisheries of this county in 1915 amounted to 14,085,399 pounds, valued at $183,806, and the investment was $455,887. The number of persons employed in the fisheries and various shore industries was 694. Monterey, located on Monterey Bay, is the center of the fisheries of the county. There are located here 13 wholesale fresh-fish houses and two canneries, where the only sardines canned in the State were canned during the year. In addition to these species, one of these houses also prepared canned, mild-cured, and salted salmon. One firm also was engaged in drying squid, which was mostly for export to China. The only real abalone cannery operated in the State during 1915 was located at Point Lobas, about 5 miles south of Monterey. Monterey Bay is the southern limit of salmon, and the major portion of those found there are chinook, a comparatively small number of silver salmon also being taken.

Salmon usually appear in this region in large numbers, and most of the catch is taken in the spring and early summer. The salmon are taken entirely with troll lines, and practically all in the bay. The anchovies, kingfish, mussels, perch, sardines, and squid are also practically all taken in the bay, and the rockfishes, "lingcod," jewfish, sablefish, and sole are all taken in the ocean. Sardines come in June and from that time until early in August are rather small in size. After this they run larger and continue so until winter. During December and January they are especially large. From March until late in May there are no sardines of any consequence. The catch for the year was rather poor.

In quantity the catch of squid was greater than any other, but in value the catch of chinook salmon was more than double that of any other species. The amount of squid taken was 6,140,000 pounds, valued at $30,700. The next in quantity were sardines, with a catch of 4,006,200 pounds, valued at $20,031. The catch of chinook salmon and rockfishes, all of which were taken by lines, was 1,694,660 pounds, valued at $67,786, and 1,306,816 pounds, valued at $41,818, respectively. Some silver salmon and other species were also taken with lines, but in minor quantities.

The lampara net fishery produced the greatest quantity; the total catch of this apparatus was 8,923,200 pounds, valued at $46,151. The low value of the lampara catch is explained by the fact that nearly two-thirds of the amount taken were squid, which sold for about $10 per ton, practically all of them being handled by one firm for drying for the Chinese trade.

Squid are dried by the sun-and-air process. A suitable plat is selected beyond the city limits, because the city authorities prohibit the work within the limits on account of the disagreeable odor and the burning off of the grass which is necessary, because the phosphoric acid and salt water in the squid would kill it and cause it to rot, thus rendering the ground unsuitable for drying. The squid are spread on the ground, turned and worked over every day until thoroughly dried. Under favorable conditions 10 to 12 days are sufficient time for drying. Under normal conditions the quantity of fresh squid reported would have yielded a larger percentage of the dried product, but certain conditions were unfavorable during the season, and some were lost.

Other species taken by lampara nets were sardines, 2,906,200 pounds, valued at $14,531, and a small lot of anchovies and herring.

The seine catch was largely made up of sardines, which amounted to 1,100,000 pounds, valued at $5,500. Small quantities of barracuda and squid were also taken with seines.

As stated above, this is the only county in the State in which abalone canning was done in 1915, except a small lot brought from Mexico and packed at a San Diego tuna plant. The catch, including those taken for the cannery and some by independent fishermen from Monterey, amounted to 547,424 pounds, valued at $10,939. The abalone subsist on vegetable matter and are found only on rock bottom where there is a sufficient growth of vegetation to maintain them. Several varieties are found on the California coast, but the red abalone is the one with which we have to deal chiefly, as that is utilized for canning at Point Lobas. Other varieties are the green, black, pink, and corrugated. The red abalone is found from northern California to the Santa Barbara Island region. Only about 10 per

cent of the red shells are suitable for commercial purposes. They are sold for manufacture into novelties and various kinds of ornaments.

As very few red abalones are exposed at low tide, and as they are not found in water deeper than will permit of the penetration of sufficient sunlight to support the vegetable growth on which the abalone depends for subsistence, they are mostly taken by divers, who use a regular diving outfit such as is employed by wreckers and other workers under water. A diving outfit, including the helmet, suit, air pumps, etc., costs about $800. The divers are all Japanese, and they require that the pumps and life lines be operated by men of their own selection, who are generally some of their own people. The depth of the water in which they operate does not often exceed 125 feet, but they have worked at a depth of 150 feet. The greater the depth the more difficult it is to furnish air to the men, and it is not necessary to take risks, as there seems to be a sufficient supply of abalone at less depth. The divers rarely get out of sight of land, work only when the water is smooth, and frequently go out and return without making a descent or with only a part of a day's work done because of rough seas. A diver usually remains under water 2½ to 3 hours and uses a short pointed iron, similar to a crowbar, to pry the abalone from the rocks. If one is expert enough to get the iron under the shell before the abalone has been disturbed and has had an opportunity to take hold of the rock, it is comparatively easy to capture it; otherwise it can take such a firm grip that it is very difficult to get it up with the iron and impossible to break the hold with the hands alone. The abalone are hauled up to the boat in carriers made with manila rope of about one-fourth inch diameter, one of which is attached to each end of a line suspended from the boat; as one carrier is raised the other is lowered. From one to two dozen are placed in a carrier, the weight averaging 45 pounds to a dozen.

For shoal-water fishing the fishermen use a small boat and hooked pole. To aid in locating the abalone they have a wooden box averaging about 8 by 11 inches at the top, widening toward the bottom to about 16 by 19 inches, and about 19 to 20 inches deep, the top being open and the bottom fitted with a glass. This box is attached to the side of the boat by strings, so that it may be easily removed when returning to port, with the bottom immersed so that the fisherman can get a good view of the ocean bottom as he peers through the glass. The poles vary in length from 1 to about 4 fathoms, as that is about the maximum depth of water fished in this way. The lower end is fitted with an iron hook, and the fisherman holding the pole in his hand can by a quick movement insert the hook under the edge of the shell and jerk it loose from the rock.

The law permits abalone fishing in this county at any time except during the month of February, when the abalone are protected because of spawning. The spawning period, however, is said to extend from about the middle of January until about the middle of March. It is estimated that an adult female will produce upward of one million eggs during the season. When liberated and fertilized, the eggs are said to float about for a time and then settle on the bottom for reproduction, and there is no doubt that many of them settle on sandy or soft bottom and are lost.

One hundred pounds of abalone in the shell will yield about 60 pounds of meat. When preparing for canning only about 30 per cent of the meat is used, the remainder being discarded as unfit for

packing. The meat as it comes from the shell is very tough, and it is necessary to pound it well with sticks in order to break the fiber. Abalone were not taken in the southern counties of California during 1915 for commercial purposes, the law prohibiting having more than 10 of them in one's possession at one time, precluding any effort toward commercializing the fishery. In past years considerable quantities were taken in Los Angeles County.

Santa Cruz County.—The aggregate product of the fisheries of this county in 1915 was 3,952,257 pounds, valued at $125,077. Nearly 50 per cent of this amount was sole, the catch of that species amounting to 1,892,600 pounds, valued at $52,315. Flounders also contributed largely to this total, the catch being 746,935 pounds, valued at $21,596. The entire catch of sole and flounders was taken in paranzella nets. "Lingcod," hake, kingfish, and other species are also taken in these nets.

With the exception of crabs, the gill-net catch of this county is of minor importance. The crab gill nets do not differ in general construction from any other. They are made of No. 6 cotton twine, about 45 fathoms long, 15 feet deep, and 7½-inch mesh. They are put out in the evening, usually about six of the 45-fathom lengths in a string, and sunk so that the lead line is near the bottom, with a buoy line attached to each end. They are permitted to drift during the night and are taken up in the morning. This method of fishing crabs has been in vogue for about four years and is usually quite remunerative. Crab lines are not used here, but a small number of crabs are taken in paranzella nets. The catch of crabs in 1915 was 233,473 pounds, valued at $15,917.

Rockfishes and salmon constituted the bulk of the line catch. The rockfishes taken amounted to 378,478 pounds, fresh, valued at $11,355, and 8,000 pounds, salted, valued at $400. The catch of chinook salmon amounted to 100,592 pounds, valued at $4,023, and that of silver salmon to 28,697 pounds, valued at $1,147. Some "lingcod," sablefish, and kingfish were also taken by lines.

Octopi have been known to exist in this region for some time and have been taken in paranzella nets, but no special effort has been made to capture them until recently. A Santa Cruz fisherman constructed some traps for the purpose of catching crabs, but on lifting the traps found them filled with octopi instead of crabs and decided they could be taken in sufficient quantities to justify further efforts. These traps are made of galvanized wire of 1-inch mesh and are about 3 feet long, 2½ feet wide, and 1½ feet high. They have openings in the top about 8 inches square for the entrance of the octopi, and doors in the end for the removal of the catch. The traps are baited with skates or any fish offal that is available, and are set singly with a buoy line attached to each. The season is chiefly during the winter and spring. The catch is shipped to San Francisco, where there is quite a demand from the Orientals, who consider this fish a delicacy. Only 6,000 pounds, valued at $600, were taken during 1915, but there is every reason to believe that subsequent years will show a considerable increase in this business. Practically all the catch of this county is shipped to San Francisco, by several wholesale dealers in Santa Cruz, and practically all the fishermen of the county hail from that point. The investment in the fisheries of the county for the year was $71,275, and the total number of persons employed was 65.

Santa Barbara County.—The fisheries of this county produced 638,600 pounds, valued at $41,130, in 1915 and are centered at Santa Barbara, where the only wholesale market in the county is located. Santa Barbara Channel, located off this county, is the northern limit of spiny lobsters. They are taken in considerable numbers by fishermen camping on the islands in the channel, chiefly Ana Capa and Santa Cruz, and also by some fishing from Santa Barbara. This fishery contributed about 50 per cent of the total value of the products for the county, the catch amounting to 158,300 pounds, valued at $20,729. The gill-net fishery contributed about 49 per cent of the total catch of the county.

Orange County.—This county, located on the southern coast of the State, between the two important fishing counties of Los Angeles and San Diego, is much more thinly settled and is comparaatively unimportant in its fisheries. The fisheries are conducted from only two localities, Newport and Laguna Beach, and the products amounted to 988,980 pounds, valued at $38,702. The most important form of apparatus was seines, the catch of which was over 25 per cent of the total quantity, and over 30 per cent of the total value for the county. Smelt constituted the bulk of the catch with this apparatus, the catch of this species amounting to 226,000 pounds, valued at $11,300. The catch by lines, amounting to 261,380 pounds, valued at $8,356, ranked next in both quantity and value, and barracuda and rockfishes were the most important species. The gill-net fishery, which amounted to 132,950 pounds, valued at $4,795, was next in importance in value, with sea bass and barracuda the leading species. The catch with lampara nets was 198,000 pounds, valued at $4,920, and consisted chiefly of rock bass and yellowtail. The trammel-net catch was all flounders and amounted to 132,250 pounds, valued at $6,308. Spiny lobsters, worth $2,093, and a small lot of hard clams were also taken by the fishermen of this county.

San Luis Obispo.—Although this county has quite an extensive coast line, it is very sparsely settled, and the commerical fisheries are of little importance when compared with some of the other coastal counties. Pismo and Morro are the only localities from which commercial fisheries are prosecuted. Clam forks, gill nets, and lines were the only forms of apparatus used. The total catch amounted to 197,856 pounds, valued at $16,420. The catch taken with lines was 85,000 pounds of rockfishes, valued at $3,400, which was greater in quantity than that with any other apparatus, but the value of the hard clams, taken with forks, amounted to more than 55 per cent of the total value of that species for the State. The quantity of hard clams taken was 34,856 pounds, valued at $9,150.

Ventura County.—The product of the fisheries of this county amounted to 106,765 pounds, valued at $5,443. Of the 27 counties in which commercial fisheries are conducted in California, this county is among the least important; there are only three counties in which the value of the catch was less than in Ventura, two of them being located on Sacramento River and one on the coast. The fishing is all done from Ventura, a small town of only a few thousand inhabitants, and the bulk of the catch consisted of smelt, taken with seines; flounders, taken with trammel nets; rockfishes and flounders, taken with lines; and spiny lobsters, which are always caught in pots.

Persons Engaged, Investment, and Products of the Fisheries of California in 1915, by Counties.

	Alameda.		Butte.		Colusa.		Contra Costa.		Del Norte.		Glenn.		Humboldt.	
PERSONS ENGAGED.	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*
On vessels transporting							4							
In shore fisheries	58		40		58		444		141		26		208	
On shore, in canneries, etc	47		15		9		279		89		6		7	
Total	105		55		67		727		230		32		215	
INVESTMENT.														
Vessels transporting							2	$5,500						
Tonnage							12							
Outfit								425						
Boats:														
Gasoline	12	$14,900			1	$400	84	51,700	9	$4,050	1	$200	14	$7,200
Sail, row, etc	32	1,025	15	$375	15	1,655	160	21,900	65	2,490	6	400	145	3,430
Apparatus, shore fisheries:														
Seines			13	1,300	9	675	6	625	2	700	5	425	9	750
Length in yards			1,755		825		1,170		440		550		1,570	
Gill nets	9	1,585					395	109,650	114	26,150	1	125	275	18,205
Length in yards	7,080						211,050		22,320		150		39,450	
Beam trawls	9	400												
Hoop nets									200	500			145	250
Dip nets													5	50
Lines		80				1								25
Dredges, tongs, hoes, etc		30			35	330				1				3
Fyke nets														
Shore and accessory property		80,850		2,200		1,625		136,200		51,680		800		400
Cash capital		16,500						18,000		25,000				
Total		115,370		3,875		4,686		344,000		110,571		1,950		30,313
PRODUCTS.	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Carp					2,800	$80	97,000	$1,530						
Catfish					6,700	264								
Flounders: Fresh	5,000	$150					16,000	238					51,548	$1,858
Herring: Fresh							7,000	34					25,494	503
"Lingcod:" Fresh													2,609	104
Perch	2,000	180					12,000	400					15,000	410
Pike, Sacramento					400	20	4,600	90						
Rockfishes: Fresh													16,905	577

Salmon:														
Chinook, fresh	300	18	81,500	$6,520	44,000	3,360	1,860,425	95,974	704,420	$16,002	81,300	$6,095	499,196	19,501
Silver									190,398	3,730			86,072	3,304
Steelhead trout													32,405	1,288
Shad:														
Fresh							4,348,640	45,800						
Roe					1,500	145								
Sharks	65,000	163					12,000	780					39,889	1,688
Smelts	31,500	2,175												
Sting-ray	605,000	1,512												
Striped bass	99,000	7,565	500	40	700	63	1,036,263	84,676			1,500	120		
Sturgeon			600	40	2,030	135					3,000	310	8,010	250
Sturgeon roe			200	120	326	147					300	180		
Surf fish													20,000	600
Miscellaneous fishes							1,400	28						
Clams:													1,760	427
Hard													6,280	1,250
Soft	21,250	5,950												
Mussels	130	35							2,650	180			42	14
Oysters: Eastern, market									26,667	2,000			24,420	1,022
Crabs														
Shrimp	263,000	4,850												
Total	1,092,180	22,598	82,800	6,720	58,456	4,214	7,395,328	229,550	924,135	21,912	86,100	6,705	829,630	32,796

	Los Angeles.		Marin.		Mendocino.		Monterey.		Orange.		Sacramento.		San Diego.	
PERSONS ENGAGED.	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*
On vessels fishing	114						6						37	
On vessels transporting	9						171		56		162		336	
In shore fisheries	825		166		40		517		2		33		653	
On shore, in canneries, etc	1,480		29											
Total	2,428		195		40		694		58		195		1,026	
INVESTMENT.														
Vessels fishing:	38	$85,700											13	$34,550
Tonnage	343												112	
Outfit		9,175												5,766
Vessels transporting	*a* 6	21,800					3	$12,500						
Tonnage	203						21							
Outfit		1,190						785						
Boats:														
Gasoline	324	521,800	52	$20,900	11	$4,300	124	76,000	19	$17,150	68	$16,000	135	196,250
Sail, row, etc	40	1,115	53	3,350	41	925	19	5,700	10	290	83	11,340	27	721

a Includes 2 scows of 146 net tons, valued at $5,500.

PERSONS ENGAGED, INVESTMENT, AND PRODUCTS OF THE FISHERIES OF CALIFORNIA IN 1915, BY COUNTIES—Continued.

	Los Angeles.		Marin.		Mendocino.		Monterey.		Orange.		Sacramento.		San Diego.	
INVESTMENT—continued.														
Apparatus, vessel fisheries:	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*
Seines	6	$8,400												
Length in yards	3,600													
Gill nets	153	4,255												
Length in yards	10,600													
Pots	20	50											60	$150
Lines	392													375
Lampara nets	1	400												
Paranzella nets	1	250												
Trammel nets	95	2,325											30	750
Length in yards	7,600												2,400	
Apparatus, shore fisheries:														
Seines			18	$1,425			1	$1,600	16	$4,120				
Length in yards			2,220				320		4,800					
Gill nets	1,244	35,870	47	6,510	25	$500	7	2,250	150	4,200	111	$13,525	486	12,150
Length in yards	71,680		20,195		875		5,580		8,400		24,010		26,640	
Hoop nets			630	1,260										
Pots and traps	1,432	3,164							250	620			1,053	2,333
Lines		2,742		95		750		1,980		213				1,795
Dredges, tongs, hoes, etc				281		5				5				
Lampara nets	37	14,800					20	11,200	1	400				
Paranzella nets	32	4,800												
Trammel nets	1,401	39,000	1	100					180	4,500			520	10,400
Length in yards	67,440		320						14,400				41,000	
Fyke nets											280	2,725		
Abalone outfit				1		1		1,636						800
Shore and accessory property		1,097,101		119,740		200		274,081		1,850		42,250		241,661
Cash capital		187,072		7,000				68,155		2,000		7,800		117,500
Total		2,041,401		160,662		6,681		455,887		35,348		93,640		625,201
PRODUCTS.														
Albacore (or tuna):	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Fresh	17,367,259	$260,667							6,000	$150			3,630,931	$54,505
Salted													25,000	481
Anchovies:														
Fresh	12,585	130												
Salted							16,000	$1,600						
Barracuda:														
Fresh	1,555,162	59,256					34,000	680	81,800	3,872			1,415,904	41,121
Salted													330,000	13,180
Bonito	370,844	10,840					2,000	50	2,950	88			42,462	774

Carp											43,201	8554		
Catfish											91,646	3,888		
Croaker	3,150	65												
Flounders:														
Fresh	1,349,103	51,731	7,500	$150	13,000	$590	51,000	1,275	135,150	6,391			2,182,158	83,826
Salted							9,500	475						
Hake:														
Fresh	17,322	571							3,300	107			24,000	960
Salted											42,237	2,122		
Hardhead														
Herring:														
Fresh			210,000	1,390			1,000	20						
Salted			50,000	1,000										
Jewfish:														
Fresh	20,890	414					300	10	4,200	84			87,071	1,271
Salted													138,000	5,020
Kingfish	335,255	8,904					38,350	958	18,500	370			2,156	50
"Lingcod:" Fresh					1,000	40	103,000	2,060						
Mackerel:														
Fresh	174,481	5,031							63,500	1,270			10,805	216
Salted													6,450	259
Mullet									3,000	300				
Perch	44,268	1,014	97,500	1,965			6,000	300	5,500	165			217	5
Pike, Sacramento											4,887	171		
Pompano	15,690	1,568							850	85			229	27
Rock bass:														
Fresh	258,334	10,331							143,500	3,587			489,450	10,032
Salted													2,750	97
Rockfishes: Fresh	690,131	21,882	3,000	125	35,000	1,750	1,306,816	41,818	141,280	4,235			734,464	16,703
Sablefish							17,560	878						
Salmon:														
Chinook—														
Fresh	66,000	3,330	6,900	330	80,500	4,190	1,694,660	67,786			214,346	12,441		
Salted					20,000	2,400								
Chum	38,093	190												
Silver	12,330	370			26,500	1,060	70,000	2,800						
Sardines:														
Fresh	305,150	6,103					4,006,200	20,031	22,500	225				
Salted			1,400	80										
Sculpin	6,613	263							1,850	75				
Sea bass	446,064	16,953	70,500	3,500			13,360	547	35,200	1,735			261,703	8,351
Sea trout	464	23							3,500	105			119	5
Shad:														
Fresh											16,826	313		
Salted											10,000	125		
Roe											2,940	287		
Sharks	2,500	50												
Skates	6,000	120												
Smelts	97,737	4,168	78,600	3,900			5,314	425	226,000	11,300			115,707	5,597
Sole	19,692	591	50	2									679	19
Spanish mackerel	295,571	9,348											60,034	1,381
Split-tail											15,475	328		
Striped bass			26,900	2,165							34,354	2,839		

PERSONS ENGAGED, INVESTMENT, AND PRODUCTS OF THE FISHERIES OF CALIFORNIA IN 1915, BY COUNTIES—Continued.

PRODUCTS—continued.	Los Angeles.		Marin.		Mendocino.		Monterey.		Orange.		Sacramento.		San Diego.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Sturgeon											620	$49		
Surf fish			68,500	$4,795										
Yellowtail:														
Fresh	679,868	$18,876							73,500	$2,205			337,898	$4,954
Salted													124,500	4,743
Miscellaneous fishes	1,972	42	5,300	225							635	15	496	8
Abalone:														
Alive					3,035	$97							57,000	3,168
Meat			4,550	158	3,000	185	547,424	$10,939					72,000	1,440
Shells			2,000	450										
Pearls and blisters				40										
Clams:														
Hard	296	104	26,416	7,070			96	25	800	260				
Soft			11,880	4,422										
Mussels	4,820	578	120	8	3,500	200	1,810	110						
Oysters:														
Eastern, market			14,840	8,814										
Native, market			8,435	6,513										
Squid	21,325	426					6,140,000	30,700						
Crabs			168,600	16,494			17,210	129						
Spiney lobsters	201,094	20,415							16,100	2,093			500,313	84,726
Turtles	184	9												
Kelp	3,000,000	1,500											20,000,000	1,000
Other seaweeds							3,799	190						
Total	27,420,247	515,863	862,991	63,596	185,535	10,512	14,085,399	183,806	988,980	38,702	477,167	23,132	12,652,996	343,919

PERSONS ENGAGED.	San Francisco.		San Joaquin.		San Luis Obispo.		San Mateo.		Santa Barbara.		Santa Cruz.		Shasta.	
	Number.	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*
On vessels fishing	392										4			
On vessels transporting	9								2					
In shore fisheries	552		137		54		8		74		55		20	
On shore, in canneries, etc	261		29				32		8		6			
Total	1,214		166		54		40		84		65		20	

INVESTMENT.														
Vessels fishing	19	$223,625									1	$6,000		
Tonnage	2,721										11			
Outfit		36,050										1,500		
Vessels transporting	5	19,500							1	$2,000				
Tonnage	68								6					
Outfit		1,525								100				
Boats:														
Gasoline	290	259,710	57	$25,825	5	$1,400	3	$2,275	14	17,400	45	37,775		
Sail, row, etc	105	8,805	60	5,950	4	200			31	1,295	8	245	6	$110
Apparatus, vessel fisheries:														
Lines		775									1	400		
Paranzella nets	6	2,250												
Apparatus, shore fisheries:														
Seines	21	2,025	12	1,335			1	5					3	350
Length in yards	1,075		1,575				5		156	5,004	180	5,000	420	
Gill nets	271	54,450	130	25,120	28	1,072			10,018		14,400			
Length in yards	38,300		41,550		2,144									
Hoop nets	3,800	11,400					20	60	1,310	2,720	12	60		
Pots and traps										20		460		
Lines		2,300				75		4						3
Dredges, tongs, hoes, etc		776				52		3						
Lampara nets	6	2,700									4	1,300		
Paranzella nets									85	2,125				
Trammel nets									2,800					
Length in yards														
Bag nets	70	2,000												
Fyke nets			1,900	16,585								20		
Abalone outfit												11,015		500
Shore and accessory property		499,450		29,875		300		58,632		10,950		7,500		
Cash capital		57,000		8,300				5,000		5,000				
Total		184,341		112,990		3,099		65,979		46,614		71,275		963

PRODUCTS.	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Anchovies: Fresh	68,800	$1,600							162,000	$6,210	5,780	$231		
Barracuda: Fresh	5,000	200			3,000	$120			30,000	870				
Bonito														
Carp	120,000	2,400	63,286	$1,474										
Catfish			328,787	16,338										
Cod, salted	4,952,692	161,695							115,500	3,855	746,935	21,596		
Flounders: Fresh	2,227,919	37,217							6,650	219	33,630	336		
Hake: Fresh	160,350	704												
Hardhead			4,674	146							890	19		
Herring: Fresh	500,000	5,000							4,000	80				
Jewfish: Fresh									2,000	40	162,457	4,873		
Kingfish	91,785	2,057												
"Lingcod:"											121,400	3,642		
Fresh	340,151	8,721									3,500	175		
Salted														

PERSONS ENGAGED, INVESTMENT, AND PRODUCTS OF THE FISHERIES OF CALIFORNIA IN 1915, BY COUNTIES—Continued.

PRODUCTS—continued.	San Francisco.		San Joaquin.		San Luis Obispo.		San Mateo.		Santa Barbara.		Santa Cruz.		Shasta.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Mackerel: Fresh									5,000	$145	113	$6		
Perch	16,450	$1,250							1,000	20	6,000	300		
Pike, Sacramento			4,960	$129										
Pompano	1,894	284									687	68		
Rock bass: Fresh									4,000	160				
Rockfishes:														
Fresh	852,300	40,519			85,000	$3,400	18,000	$550	24,000	768	388,278	11,649		
Salted											8,000	400		
Sablefish	39,920	130									7,023	351		
Salmon:														
Chinook, Fresh	136,000	7,500	200,409	10,390							119,592	4,783	19,750	$1,147
Silver											29,897	1,195		
Sardines: Fresh	30,925	1,052							1,000	20	21,931	220		
Sculpin											350	7		
Sea bass	256,325	12,871	1,250	50					50,000	1,900	86,860	3,474		
Sea trout									2,000	80				
Shad:														
Fresh	1,600,000	9,000	636,820	8,047							478	24		
Roe			17,898	1,619										
Sharks	472	23												
Skates	164,050	672									7,600	76		
Smelts	374,000	15,295			75,000	3,750	1,500	60	16,325	865	30,000	1,200		
Sole	3,848,908	55,327									1,892,600	52,315		
Spanish mackerel									41,300	826				
Splittail			1,466	55										
Striped bass	283,000	24,000	69,646	5,898							350	17	1,247	142
Sturgeon			59	5										
Sturgeon roe			22	11										
Tomcod	33,112	587									8,800	352		
Whitebait	56,250	2,250												
Yellowtail: Fresh									3,150	88				
Miscellaneous fishes	6,000	150	1,375	70										
Abalone: Alive											20,991	420		
Clams:														
Hard					34,856	9,150					1,032	272		
Soft	23,000	5,300					2,200	700						
Mussels	6,000	1,200									210	15		
Oysters: Eastern, market	360,892	156,745												
Octopus	18,909	1,573									13,400	1,144		
Squid	50,000	1,500												
Crabs	934,985	91,972					4,800	600			233,473	15,917		
Spiney lobsters									158,300	20,729				

Shrimp	35,000	700												
Turtles			22	4										
Sea lion									9,375	4,120				
Cod tongues	7,400	370												
Other seaweeds									3,000	135				
Total	17,602,489	649,864	1,330,674	44,236	197,856	16,420	26,500	1,910	638,600	41,130	3,952,257	125,077	20,997	1,289

	Solano.		Sonoma.		Sutter.		Tehama.		Ventura.		Yolo.		Total.	
PERSONS ENGAGED.	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*
On vessels fishing									4				551	
On vessels transporting	5												35	
In shore fisheries	384		35		20		110		10		92		4,282	
On shore, in canneries, etc	39						39				4		3,584	
Total	428		35		20		149		14		96		8,452	
INVESTMENT.														
Vessels fishing									2	$4,500			73	$354,375
Tonnage									11				3,198	
Outfit										300				52,791
Vessels transporting	3	$10,700											20	72,000
Tonnage	20												330	
Outfit		1,485												5,510
Boats:														
Gasoline	110	61,200	8	$5,475	5	$1,200					38	$8,000	1,429	1,351,110
Sail, row, etc	163	28,500	12	275	8	180	24	$545	5	250	32	3,745	1,169	104,816
Apparatus, vessel fisheries:														
Seines							1	150					7	8,550
Length in yards							100						3,700	
Gill nets													153	
Length in yards													10,600	4,255
Pots									40	80			120	280
Lines										20				1,562
Lampara nets													1	400
Paranzella nets													8	2,900
Trammel nets													125	3,075
Length in yards													10,000	
Apparatus, shore fisheries:														
Seines			1	200	3	375	22	2,925	2	300	3	350	147	19,485
Length in yards			150		450		3,235		200		435		21,195	
Gill nets	259	82,450	6	1,800	12	1,500	2	225			60	6,250	950	413,591
Length in yards	39,200		3,000		2,040		300				11,080		799,552	
Beam trawls													9	400
Hoop nets			65	115									4,860	13,585
Dip nets			6	14									11	64

PERSONS ENGAGED, INVESTMENT, AND PRODUCTS OF THE FISHERIES OF CALIFORNIA IN 1915, BY COUNTIES—Continued.

	Solano.		Sonoma.		Sutter.		Tehama.		Ventura		Yolo.		Total.	
INVESTMENT—continued.														
Apparatus, shore fisheries—Contd.	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*
Pots and traps									130	$260			4,187	$9,157
Lines				$255						50				10,849
Dredges, tongs, hoes, etc				11										1,170
Lampara nets													64	29,100
Paranzella nets													36	6,100
Trammel nets									8	200			2,195	56,325
Length in yards									640				126,600	
Bag nets													70	2,000
Fyke nets					50	$350					220	$1,650	2,485	21,640
Abalone outfit				2										2,460
Shore and accessory property		$60,625		585		200		$3,170				5,450		2,731,390
Cash capital		10,000										3,500		545,327
Total		254,960		8,732		3,805		6,865		6,610		28,945		5,824,263
PRODUCTS.														
Albacore (or tuna):	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Fresh									20,000	300			21,024,190	$315,622
Salted													25,000	481
Anchovies:														
Fresh													81,385	1,730
Salted													16,000	1,600
Barracuda:														
Fresh													3,262,646	111,690
Salted													330,000	13,180
Bonito													448,256	12,622
Carp					11,802	$131					12,726	$197	350,815	6,366
Catfish					49,346	2,021	275	$11			40,300	1,777	517,054	24,299
Cod, salted													4,952,692	161,695
Croaker													3,150	65
Flounders:														
Fresh			1,500	$60					11,250	$354			6,914,063	209,291
Salted													9,500	475
Hake:														
Fresh													221,252	1,937
Salted													24,000	960
Hardhead					1,724	126					24,788	1,228	73,423	3,622
Herring:														
Fresh			20,000	150									764,384	7,116
Salted													50,000	1,000

Jewfish:													116,461	1,859
Fresh													138,000	5,020
Salted									5,500	110			656,003	17,362
Kingfish													570,860	14,687
"Lingcod:"			2,700	120									3,500	175
Fresh														
Salted													253,899	6,668
Mackerel:													6,450	259
Fresh													3,000	300
Salted													216,785	6,327
Mullet			10,000	300					850	18			15,884	449
Perch					523	19					489	19	19,350	2,032
Pike, Sacramento	25	$1												
Pompano													895,284	24,110
Rock bass:													2,750	97
Fresh														
Salted													4,336,254	145,816
Rockfishes:			22,000	1,110					19,080	730			8,000	400
Fresh													64,503	1,359
Salted														
Sablefish														
Salmon:														
Chinook—													7,283,933	338,549
Fresh	1,179,244	60,524	18,000	560	3,071	173	185,760	13,165			88,560	4,760	20,000	2,400
Salted													38,053	190
Chum													415,191	12,459
Silver													32,405	1,288
Steelhead trout														
Sardines:													4,387,706	27,651
Fresh													1,400	80
Salted													8,813	345
Sculpin													1,221,262	49,381
Sea bass													6,083	213
Sea trout														
Shad:													6,846,008	66,982
Fresh	176,827	2,650			1,245	36	210	4			64,962	1,108	10,000	125
Salted													27,033	2,491
Roe					61	6					4,634	434	67,972	236
Sharks													177,650	868
Skates													1,137,072	52,978
Smelts									33,500	1,775			5,761,929	108,254
Sole													396,905	11,555
Spanish mackerel													17,016	384
Split-tail					75	1							605,000	1,512
Stingray													1,784,448	146,928
Striped bass	208,544	17,787	3,250	260	5,744	407	539	38			12,911	911	16,924	987
Sturgeon	2,367	181					55	3			183	14	1,275	708
Sturgeon roe	427	250											127,500	7,255
Surf fish			39,000	1,860									41,912	939
Tomcod													56,250	2,250
Whitebait														

PERSONS ENGAGED, INVESTMENT, AND PRODUCTS OF THE FISHERIES OF CALIFORNIA IN 1915, BY COUNTIES—Continued.

	Solano.		Sonoma.		Sutter.		Tehama.		Ventura.		Yolo.		Total.	
PRODUCTS—continued.														
Yellowtail:	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*
Fresh													1,094,416	$26,123
Salted													124,500	4,743
Miscellaneous fishes					54	$1							17,232	539
Abalone:														
Alive													24,026	517
Meat			119,000	$2,380									730,974	16,830
Shells													74,000	1,890
Pearls and blisters				1,200										1,240
Clams:														
Hard			600	275									65,856	17,583
Soft			2,550	485									67,160	18,107
Mussels													19,240	2,326
Oysters:														
Eastern, market													375,774	165,573
Native, market													8,435	6,513
Octopus													32,309	2,717
Squid													6,211,325	32,626
Crabs			4,000	300									1,414,155	128,434
Crawfish			550	265									550	265
Spiney lobsters									16,585	$2,156			892,392	130,119
Shrimp													298,000	5,550
Turtles													206	13
Sea lion													9,375	4,120
Cod tongues													7,400	370
Kelp													5,000,000	2,500
Other seaweed													6,799	325
Total	1,567,434	$81,393	243,150	9,325	73,645	2,921	186,839	$13,221	106,765	5,443	249,553	$10,448	93,338,703	2,506,702

PRODUCTS BY APPARATUS.

Many different forms of apparatus are used in the fisheries of California. Some of these, introduced by Italians, are similar to those used by them in their native country. Among these may be mentioned the paranzella net and lampara net, with which large catches are made. The different forms of apparatus will be described briefly in the order of their importance, based on the value of the catch. While pound nets rank as one of the important forms of apparatus used in the fisheries of Washington and Oregon, none was used in California in either 1915 or 1904.

Lines.—Lines rank first both in the quantity and value of the catch which, in 1915, amounted to 34,872,139 pounds, with a value to the fishermen of $681,825. Of this output 28,431,372 pounds were taken in the shore, and the remainder in the vessel, fisheries. As compared with the last canvass by this Bureau for 1904, there is shown an increase of nearly 235 per cent in quantity and 149 per cent in value. This extraordinary increase may be traced mainly to the development of the albacore, or tuna, canning industry, which was in its infancy in 1904. A noticeable increase is also shown in the output of rockfishes and chinook salmon. The albacore fishery is confined almost exclusively to Los Angeles and San Diego Counties, the former furnishing more than 82 per cent of the State's catch. The line fisheries of Monterey County are of noticeable importance and are divided between the hand-line or trolling fishery for chinook salmon and the trawl-line fishery for rockfishes. Most of the other species are taken incidentally along with the two just named. Trolling for chinook salmon in Monterey Bay has developed into an important industry within recent years. Power boats are commonly used in this fishery. Two poles, one a little longer than the other, are generally set in sockets on each side of the boat, while two lines are set from the stern. As the boat moves slowly forward these lines are put out and in the above positions are clear of each other. To the other end of each pole is suspended a small tin can with a few pebbles in it. When a fish is hooked its struggles cause the pebbles in the can to rattle, and the fisherman then takes in the pole and pulls the fish in hand over hand.

The trolling in Santa Cruz and Mendocino Counties also is worthy of mention. The trolling, as well as most of the other fishing from these two counties, is followed from Santa Cruz and Fort Bragg, respectively.

Gill nets.—Gill nets rank next to lines in the value of their catch, the latter in 1915 amounting to 21,317,668 pounds, valued at $676,062, credited mostly to the shore fisheries. As compared with 1904, an increase of 4,280,643 pounds in quantity and $54,974 in value is shown, the increase in quantity being traced mainly to the shad fishery of the Sacramento River. This species, however, did not give a proportionately increased value to the fisheries. There was a decided decline in the catch of chinook salmon with gill nets, but this was made up by increased catches of other species. Notwithstanding its decline, chinook salmon was still the most valuable species taken with gill nets in California, followed in importance by the striped bass, barracuda, shad, sea bass, and smelt. About 32 species were taken with this apparatus, but those already mentioned

constituted the bulk of the catch. The Sacramento River, together with San Pablo and Suisun Bays, furnished the bulk of the gill-net catch of the State. While drift gill nets were used in a small way as far up the Sacramento River as Corning, Tehama County, they ceased to be important as an apparatus above Verona in Sutter County. The length of drift gill nets varies from those measuring 170 yards each, used for chinook salmon along the upper portion of the river, to those measuring 450 yards each, used for shad near the mouth of the river. The nets used for chinook salmon and striped bass near the mouth of the river average about 385 and 420 yards, respectively. In Suisun and San Pablo Bays, nets as long as 800 yards are used for striped bass, shad, and chinook salmon. Those for chinook salmon are from 40 to 45 meshes deep; those for striped bass from 30 to 65 meshes, and those for shad from 60 to 65 meshes. The size of mesh varies in the salmon net from 7½ inches to 9¾ inches; in the striped-bass net it is commonly about 5½ inches; and in the shad net from 5½ to 6½ inches, but more often of the latter size.

The bulk of the gill netting credited to Del Monte County was done in the Klamath River, from its mouth to a point 6 miles above. A cannery at Requa utilizes most of the catch. The chinook salmon run from March 1 to September 1, with a few in October, while the silver salmon run from September 20 to the last week in October. The nets on this river average 200 yards in length and 30 to 35 meshes deep. The mesh varies from 6½ to 9 inches, but more of the smaller size are used.

Gill nets constitute the most valuable apparatus used in Humboldt County, a very large percentage of the catch being taken with them. The Eel River is the only stream of any importance in the county. Practically all of the fishing in this river is done between the mouth and 3½ miles above. The drift gill nets used on the river average about 150 yards in length, and from 28 to 32 meshes deep. The mesh for chinook is 9½ to 9¾ inches, while that for silver salmon and steelhead is 6½ inches. The fishing is done from October 7 to December 7. The same fishermen in some instances fish in both the Klamath and Eel Rivers.

Paranzella nets.—Paranzella or trawl nets are used both in the vessel and shore fisheries of California, but the catch in the former is much more important. The fishing is confined to the Pacific Ocean from San Francisco, Santa Cruz, and Los Angeles Counties, that from the first-named county being much the more important. In 1915 the total catch amounted to 9,707,373 pounds, valued at $193,368, as compared with 5,637,561 pounds, valued at $104,602, in 1904. Many species are taken, but sole and flounders constitute more than 90 per cent of the catch.

The paranzella, a somewhat primitive style of net, was introduced in California by Italian fishermen in 1877. It consists of a flat, triangular bag of webbing, doubtless developed from a beach seine or bag net, with a wide but low mouth. The net rapidly narrows from the wide mouth to the cod end of the bag, which is so arranged that it can be unlaced to discharge the catch when it is hoisted aboard the boat. The nets are constructed of heavy cotton twine. The forward part of the bag is of about 4-inch mesh, the middle part still smaller, and the cod end of much heavier twine,

has a 1½-inch mesh. The mouth of the net when fishing has a spread of about 50 feet.

When the nets were first introduced they were operated with small sailboats, were necessarily of small dimensions, and dragged within San Francisco Bay and in the shallow water alongshore just outside the harbor. Later, or about 1888, steam tugs, with larger nets were employed, and the San Francisco paranzella fishery was soon in the hands of a few companies, constituting the principal wholesale fish dealers of the city.

In fishing a paranzella the steamers work in pairs and follow parallel courses about one-half mile apart, each towing one end of the net. Occasionally two nets were towed by three steamers, the center one towing an end of two nets. The drags are made either with or against the current; otherwise the net would drift sidewise and not fish properly. Two drags are usually made each day, frequently only one, the duration of a drag being 1½ to 2 hours. A crew of 4 or 5 men is carried on one of the steamers, and from 10 to 14 on the other, the latter being the one on which the net is lifted. When a drag is completed the net is hauled in by steam winches and lifted aboard by means of a derrick. Frequently the weight of the fish is so great that some of them have to be removed with a long-handled dip net before the net is lifted aboard, to prevent tearing it. Several extra nets are always carried aboard the boat.

The fishing is practically all done outside the 3-mile limit and in from 25 to 55 fathoms of water. Of the two grounds most resorted to by San Francisco vessels one lies 4 to 8 miles southwest of Point Rizes and the other about 8 miles south of the lightship off the entrance to San Francisco Harbor. The catches are not so large during the winter, the supposition being that the fish have moved out into deeper water during the period of rough weather.

While steamers are used almost entirely from San Francisco, in Santa Cruz and Los Angeles Counties only gasoline boats are used.

Trammel nets.—The catch with trammel nets in 1915 amounted to 3,510,154 pounds, valued at $134,766, showing a decline in quantity since 1904 of 261,357 pounds, but an increase in value of $59,301. The catch was made up of flounders, barracuda, and perch, but flounders comprised 88 per cent of the total. The use of these nets is confined mainly to the counties in southern California, San Diego County furnishing the largest quantity. The fishing is all done in the Pacific Ocean, nearly nine-tenths of the catch being credited to the shore fisheries.

The trammel nets used in this State are similar in construction to those in general use elsewhere, consisting of three nets instead of one, as in a gill net. The two outer nets have a 23-inch mesh and hang about 12 feet deep. The inner web has a 9-inch mesh and hangs about 16 feet deep. The two outer nets are of No. 12 cotton twine and the middle one of No. 9. The nets are from 72 to 80 yards long, and about 20 are usually tied together and fished as one net. They are set at right angles but not immediately adjoining the shore. An anchor weighing 25 pounds and a buoy, usually a 4-gallon keg, are placed at each end of the net. The lead line, weighted with about 25 pounds of lead, rests on the bottom. The nets are set either during the day or night and ordinarily remain out about 24 hours before lifting. They are commonly set a short distance from shore in from

12 to 15 fathoms of water, but occasionally they are set as far out as 4 or 5 miles in 25 fathoms. The fishing is done at almost any time during the year.

Pots and traps.—The catch with pots and traps in 1915 amounted to 909,426 pounds, having a value to the fishermen of $131,111. More than 98 per cent of the output was spiny lobsters, the remainder consisting of a few perch, rock bass, sea bass, and octopi. The use of these forms of apparatus is confined to the more southern counties of the State. The lobster pots are set on the kelp beds near the shore, where the lobsters seem to gather for protection during warm weather; but when it gets colder they move into deeper water, and the fishermen follow them with their pots. The pots are made of laths, usually about 3 feet long, 30 to 32 inches wide at the bottom, narrowing to about 12 inches at the top, and about 12 inches high. They are set singly, with a buoy line attached to each pot, in water varying in depth from 3 to 20 fathoms. When fishing in the deeper water it is often necessary to use from 40 to 60 pounds of ballast to a single pot.

Hoop nets.—With the exception of a few crawfish taken in a small stream in Sonoma County, the use of hoop nets was confined exclusively to taking crabs, the catch of which in 1915 amounted to 1,157,567 pounds, valued at $111,930, all of which were taken in the shore fisheries. Crabs are taken as far north as Del Monte County, but practically none were taken commercially south of San Francisco, from which place and vicinity most of the fishing was done. The nets are similar to those used in Washington. They are set in the Pacific Ocean, usually within a mile offshore, but a few are set as far as 9 miles out. It is customary to have an interval of 150 yards between the nets. Herring, perch, or shiners are used for bait and are placed in a small, brass-wire cage fastened to the center of the net. The hoops of the net are painted to prevent them from rusting and rotting the twine.

Lampara nets.—The total catch with lampara nets in 1915 amounted to 10,989,512 pounds, valued at $106,906, of which squid contributed about 55 per cent and sardines nearly 30 per cent of the weight. The remainder of the catch was made up of 16 other species. Lampara nets were used in San Francisco, Monterey, Los Angeles, and Orange Counties only. This net is said to have originated in Italy and was introduced into California by fishermen from that country. It is constructed somewhat on the principle of a common haul, or beach, seine, except that the lead line is shorter than the cork line, which creates a bag or bunt in the back of the net for the collection of the fish. The average length of this net is about 120 yards and the depth 35 to 50 feet. The bag, which is about 100 feet long, is made of No. 20–6 cable-laid twine, and the remainder of No. 6 cotton thread. The bunt has a 1-inch mesh, the next 50 feet of the net have a 4-inch mesh, the next 120 feet an 8-inch mesh, and the remainder an 18-inch mesh. A line, 15 fathoms long, of No. 15 manila rope, is attached to each end of the net. The twine used, the size of mesh, and also the manner of construction differ according to the individual ideas of the fishermen.

A lampara net is always hauled into a boat instead of on the beach. The fishing is usually done in shallow water, as it is desired that the lead line be on or close to the bottom. From three to five men,

with one and sometimes two skiffs are necessary to operate the net. When operated with one boat, the method is as follows: When a school of fish is sighted one end of the net, with a buoy and sometimes an anchor attached, is thrown out. The boat is then rowed in a circle around the fish, the net in the meanwhile being let out as the boat moves. When the buoy or starting point is reached an anchor is thrown out from the side of the boat away from the net to prevent the latter from being interfered with by the boat. Some of the men then begin pulling in from the bow and others from the stern of the boat until the bag is alongside, when the fish are dipped out. The net is then overhauled and made ready for another layout. It is sometimes fished from two boats by first dropping the bag of the net overboard, then the boats, each with its share of the net, being rowed in opposite directions, until the boats meet after making a circle. The men in the boats then exchange ends of the net and anchor the boats, after which they begin pulling in, keeping the wings crossed as they pull, until the bag reaches the space between the two boats. It takes at least four men with two boats to haul the net in this manner, which is followed mostly by the Japanese in the lower part of California.

Seines.—The output with seines in 1915 amounted to 3,537,965 pounds, with a value to the fishermen of $98,394. Of this amount, 2,968,737 pounds were taken in the shore, and the remainder in the vessel, fisheries. As compared with 1904, there was a decrease of 551,446 pounds in quantity, but an increase of $5,030 in value. Seines were operated in 19 of the 27 counties of the State having fisheries, but sardines taken in the shore fisheries of Monterey County constituted more than 31 per cent of the total seine catch. Chinook salmon taken in the counties bordering on the Sacramento River and smelt taken mainly in the ocean are also worthy of mention. Besides those mentioned, 30 other species were taken with seines. The seines used in the vessel fisheries were mostly purse seines, and averaged about 528 yards each in length, while those in the shore fisheries were mostly haul seines and averaged only 132 yards each in length.

Fyke nets.—Fyke nets are fished only in five counties of the State, all located on the Sacramento River and its tributary, the San Joaquin River. The latter river was much the more important of the two. The total catch in 1915 amounted to 598,776 pounds, valued at $26,327, as compared with a catch in 1904 of 541,123 pounds, valued at $15,285, showing an increase both in quantity and value, but especially the latter. In both years the catch consisted mainly of catfish, though small quantities of five other species were taken. The fyke net commonly used has five hoops, the largest being 5 feet and the smallest 2 feet in diameter, the total length of the net being 10 feet. The bait, which in fishing for catfish commonly consists of salt shad, is placed in a small knit bag at the end of the fyke net.

Abalone outfit.—The output with abalone outfits in 1915 consisted of 24,026 pounds of live abalone, valued at $517; 730,974 pounds of abalone meat, valued at $16,830; 74,000 pounds of abalone shells valued at $1,890; and $1,240 worth of pearls and blisters, the total quantity amounting to 829,000 pounds, valued at $20,477, as compared with 833,678 pounds, valued at $10,873, in 1904. The tables show a very large decrease in abalone sold alive, but an increase in

abalone meat, as compared with 1904. There has been an increase in abalone shells, but a decrease in pearls sold. Los Angeles supported an abalone industry in 1904, but laws passed since then have practically prohibited a continuation of the industry.

Kelp harvesters.—Kelp harvesters were employed in only three counties—Los Angeles, San Diego, and Ventura. The total output of kelp in 1915 amounted to 5,000,000 pounds, having a value of $2,500. No comparison can be made with any previous report, as the industry has developed since the outbreak of the European war, when the importation of potash from Germany ceased.

Dredges, tongs, rakes, forks, etc.—These forms of apparatus were employed only in the shore fisheries, the catch consisting of clams, oysters, mussels, turtles, and seaweed. The total value of these products in 1915 amounted to $210,436. As compared with the output of corresponding apparatus used in 1904, there was a decrease of $453,655 in value, this being due mainly to the decline in both the native and eastern oysters.

Miscellaneous apparatus.—Under this heading are included beam trawls, spears, dip nets, and nets for catching sea lion. The total catch in 1915 with all of these forms of apparatus combined amounted to 365,125 pounds, with a value of $12,065. The output consisted of chinook salmon, surf fish, shrimp, and sea lion.

The beam trawls are used only in Alameda County, the output consisting entirely of shrimp, taken in San Francisco Bay. The total catch in 1915 amounted to 263,000 pounds, valued at $4,850. The beam trawls are ordinarily used from gasoline launches of about 6 horsepower and are similar in construction to those used in Washington, except that they are smaller. The beam is about 18 feet long, and the iron shoes upon which it rests raise it 18 inches above the bottom. The bag is made of flax twine knit by Chinese. The fishing is commonly done in about 2 fathoms of water.

The use of spears is confined to Shasta County, the catch of chinook salmon with this apparatus being unimportant.

Dip nets are used in Humboldt and Sonoma Counties, the catch in both counties consisting entirely of surf fish. The total output in 1915 amounted to 57,000 pounds, valued at $2,320. The fishing is done entirely in the ocean. The fisherman stands at the edge of the surf and holds his net under it as it is breaking, no boat being used. The net used in Humboldt County, when made to order, costs about $10. It is triangular in shape, two of the sides consisting of wooden strips 8 feet long connected at their outer ends by a string. The netting attached to this frame sags a little below it to hold the fish. A short distance from the point of intersection, and connecting the two strips of the frame, is nailed a short strip, which serves as a handle for the net.

YIELD OF THE VESSEL FISHERIES OF CALIFORNIA IN 1915, BY COUNTIES, SPECIES, AND APPARATUS.

Apparatus and species.	Los Angeles.		San Diego.		San Francisco.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Seines:						
Albacore (or tuna)	25,000	$375				
Barracuda	158,700	6,045				
Bonito	18,020	515				
Mackerel	12,010	346				
Perch	5,790	115				
Salmon:[a]						
Chinook	66,000	3,330				
Chum	38,093	190				
Silver	12,330	370				
Sea bass	85,000	3,242				
Spanish mackerel	23,285	658				
Yellowtail	108,300	2,918				
Total	552,528	18,104				
Gill nets:						
Barracuda	328,000	12,706				
Bonito	825	24				
Perch	1,500	30				
Mackerel	4,400	122				
Sea bass	7,900	291				
Smelt	4,650	244				
Spanish mackerel	32,100	925				
Total	379,375	14,342				
Pots: Spiny lobsters	4,020	520	20,000	$2,630		
Lines:						
Albacore (or tuna)	820,845	12,295	179,000	2,675		
Barracuda, salted			130,000	5,200		
Cod, salted					4,952,692	$161,695
Hake, salted			24,000	960		
Jewfish, salted			88,000	3,520		
Rockfishes	53,100	1,565	71,000	1,420		
Spanish mackerel			11,000	400		
Yellowtail, salted			69,000	2,760		
Cod tongues					7,400	370
Total	873,945	13,860	572,000	16,935	4,960,092	162,065
Paranzella nets:						
Flounders	21,185	605			2,027,919	36,617
Hake					160,350	704
Kingfish					78,385	1,657
"Lingcod"					39,048	971
Pompano					559	84
Rockfishes					26,800	864
Sablefish					39,920	130
Sardines					125	2
Sea bass					11,325	671
Sharks					472	23
Skates					164,050	672
Sole					3,830,050	54,950
Tomcod					33,112	587
Octopus					227	18
Crabs					5,905	458
Total	21,185	605			6,418,247	98,408
Lampara nets:						
Barracuda	15,000	585				
Kingfish	4,500	90				
Mackerel	3,200	82				
Spanish mackerel	7,000	200				
Yellowtail	15,000	420				
Total	44,700	1,377				
Trammel nets: Flounders	251,500	8,485	81,500	2,403		
Kelp harvesters: Kelp	3,000,000	1,500	2,000,000	1,000		
Grand total	5,127,253	58,793	2,673,500	22,968	11,378,339	260,473

[a] The salmon were taken by a California vessel fishing in the Columbia River.

YIELD OF THE VESSEL FISHERIES OF CALIFORNIA IN 1915, BY COUNTIES, SPECIES, AND APPARATUS—Continued.

Apparatus and species.	Santa Cruz.		Ventura.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Seines:						
Albacore (or tuna)					25,000	$375
Barracuda					158,700	6,045
Bonito					18,020	515
Kingfish			3,200	$64	3,200	64
Mackerel					12,010	346
Perch					5,790	115
Salmon:[a]						
Chinook					66,000	3,330
Chum					38,093	190
Silver					12,330	370
Sea bass					85,000	3,242
Smelt			13,500	715	13,500	715
Spanish mackerel					23,285	658
Yellowtail					108,300	2,918
Total			16,700	779	569,228	18,883
Gill nets:						
Barracuda					328,000	12,706
Bonito					825	24
Perch					1,500	30
Mackerel					4,400	122
Sea bass					7,900	291
Smelt					4,650	244
Spanish mackerel					32,100	925
Total					379,375	14,342
Pots: Spiny lobsters			7,900	1,027	31,920	4,177
Lines:						
Albacore (or tuna)			29,000	300	1,019,845	15,270
Barracuda, salted					130,000	5,200
Cod, salted					4,952,692	161,695
Hake, salted					24,000	960
Jewfish, salted					88,000	3,520
Rockfishes			14,730	471	138,830	3,456
Spanish mackerel					11,000	400
Yellowtail, salted					69,000	2,760
Cod tongues					7,400	370
Total			34,730	771	6,440,767	193,631
Paranzella nets:						
Flounders	158,800	$4,660			2,207,904	41,882
Hake	7,600	76			167,950	780
Kingfish	30,200	906			108,585	2,563
"Lingcod"	8,800	264			47,848	1,235
Pompano					559	84
Rockfishes	9,800	294			36,600	1,158
Sablefish	200	10			40,120	140
Sardines					125	2
Sea bass					11,325	671
Sharks					472	23
Skates	7,000	70			171,050	742
Sole	339,400	8,485			4,169,450	63,435
Tomcod	8,800	352			41,912	939
Octopus	2,400	144			2,627	162
Crabs	9,614	655			15,519	1,113
Total	582,614	15,916			7,022,046	114,929
Lampara nets:						
Barracuda					15,000	585
Kingfish					4,500	90
Mackerel					3,200	82
Spanish mackerel					7,000	200
Yellowtail					15,000	420
Total					44,700	1,377
Trammel nets: Flounders					333,000	10,888
Kelp harvesters: Kelp					5,000,000	2,500
Grand total	582,614	15,916	59,330	2,577	19,821,036	360,727

Statistics of the Yield of the Shore Fisheries of California in 1915, by Counties, Species, and Apparatus.

BY SEINES.

Species.	Butte.		Colusa.		Contra Costa.		Del Norte.		Glenn.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Carp	.....	.....	2,300	$45	68,000	$1,020	.....	.....	.....	.....
Flounders	.....	.....	.....	.....	9,000	133	.....	.....	.....	.....
Herring: Fresh	.....	.....	.....	.....	4,500	22	.....	.....	.....	.....
Perch	.....	.....	.....	.....	10,500	340	.....	.....	.....	.....
Salmon:										
Chinook	81,500	$6,520	44,000	3,360	600	18	49,420	$1,235	80,000	$6,000
Silver	.....	.....	.....	.....	.....	.....	15,552	233	.....	.....
Shad roe	.....	.....	1,500	145	.....	.....	.....	.....	.....	.....
Shiners	.....	.....	.....	.....	1,400	28	.....	.....	.....	.....
Smelt	.....	.....	.....	.....	10,000	680	.....	.....	.....	.....
Striped bass	500	40	700	63	.....	.....	.....	.....	1,500	120
Sturgeon	600	40	2,030	135	.....	.....	.....	.....	3,000	310
Sturgeon roe	200	120	326	147	.....	.....	.....	.....	300	180
Total	82,800	6,720	50,856	3,895	104,000	2,241	64,972	1,468	84,800	6,610

Species.	Humboldt.		Marin.		Monterey.		Orange.		San Francisco.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Anchovies	.....	.....	.....	.....	.....	.....	.....	.....	32,800	$1,375
Barracuda	.....	.....	.....	.....	34,000	$680	.....	.....	.....	.....
Flounders	1,315	$37	7,500	$150	.....	.....	.....	.....	.....	.....
Herring:										
Fresh	25,494	503	180,000	1,175	.....	.....	.....	.....	.....	.....
Salted	.....	.....	50,000	1,000	.....	.....	.....	.....	.....	.....
Kingfish	.....	.....	.....	.....	.....	.....	18,500	$370	1,700	50
Mullet	.....	.....	.....	.....	.....	.....	3,000	300	.....	.....
Perch	15,000	410	85,000	1,710	.....	.....	.....	.....	15,000	1,200
Salmon: Chinook	29	1	.....	.....	.....	.....	.....	.....	.....	.....
Sardines:										
Fresh	.....	.....	.....	.....	1,100,000	5,500	.....	.....	15,200	725
Salted	.....	.....	1,400	80	.....	.....	.....	.....	.....	.....
Shiners	.....	.....	4,000	70	.....	.....	.....	.....	6,000	150
Smelt	15,524	674	13,600	775	.....	.....	226,000	11,300	1,000	45
Striped bass	.....	.....	2,500	200	.....	.....	.....	.....	.....	.....
Surf fish	.....	.....	65,000	4,550	.....	.....	.....	.....	.....	.....
Turbot	.....	.....	600	70	.....	.....	.....	.....	.....	.....
White bait	.....	.....	.....	.....	.....	.....	.....	.....	51,250	2,050
Squid	.....	.....	.....	.....	140,000	700	.....	.....	.....	.....
Total	57,362	1,625	409,600	9,780	1,274,000	6,880	247,500	11,970	122,950	5,595

Species.	San Joaquin.		San Mateo.		Shasta.		Sonoma.		Sutter.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Carp	63,286	$1,474	.....	.....	.....	.....	.....	.....	9,802	$106
Catfish	17,000	805	.....	.....	.....	.....	.....	.....	32,000	1,296
Flounders	.....	.....	.....	.....	.....	.....	1,500	$60	.....	.....
Hardhead	4,674	146	.....	.....	.....	.....	.....	.....	1,500	110
Herring: Fresh	.....	.....	.....	.....	.....	.....	20,000	150	.....	.....
Perch	.....	.....	.....	.....	.....	.....	10,000	300	.....	.....
Pike, Sacramento	4,960	129	.....	.....	.....	.....	.....	.....	.....	.....
Salmon: Chinook	7,000	360	.....	.....	19,000	$1,072	.....	.....	.....	.....
Sea bass	1,250	50	.....	.....	.....	.....	.....	.....	.....	.....
Shad	40,000	600	.....	.....	.....	.....	.....	.....	.....	.....
Shad roe	4,000	360	.....	.....	.....	.....	.....	.....	.....	.....
Smelt	.....	.....	1,500	$60	.....	.....	.....	.....	75	1
Split-tails	1,466	55	.....	.....	.....	.....	.....	.....	.....	.....
Striped bass	5,301	449	.....	.....	1,247	142	.....	.....	54	1
Suckers	1,375	70	.....	.....	.....	.....	2,000	140	.....	.....
Surf fish	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Turtles	22	4	.....	.....	.....	.....	.....	.....	.....	.....
Total	150,334	4,502	1,500	60	20,247	1,214	33,500	650	43,431	1,514

STATISTICS OF THE YIELD OF THE SHORE FISHERIES OF CALIFORNIA IN 1915, BY COUNTIES, SPECIES, AND APPARATUS—Continued.

BY SEINES—Continued.

Species.	Tehama.		Ventura.		Yolo.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Anchovies							32,800	$1,375
Barracuda							34,000	680
Carp					8,300	$126	151,688	2,771
Catfish	275	$11			984	58	50,259	2,170
Flounders							19,315	380
Hardhead					2,865	314	9,039	570
Herring:								
Fresh							229,994	1,850
Salted							50,000	1,000
Kingfish			2,300	$46			22,500	466
Mullet							3,000	300
Perch			850	18			136,350	3,978
Pike, Sacramento					39	1	4,999	130
Salmon:								
Chinook	184,133	13,084					465,682	31,650
Silver							15,552	233
Sardines:								
Fresh							1,115,200	6,225
Salted							1,400	80
Sea bass							1,250	50
Shad	200	3					40,200	603
Shad roe							5,500	505
Shiners							11,400	248
Smelt			20,000	1,060			287,624	14,594
Split-tails							1,541	56
Striped bass	539	38			400	28	12,687	1,080
Sturgeon							5,630	485
Sturgeon roe							826	447
Suckers							1,429	71
Surf fish							67,000	4,690
Turbot							600	70
White bait							51,250	2,050
Squid							140,000	700
Turtles							22	4
Total	185,147	13,136	23,150	1,124	12,588	527	2,968,737	79,511

BY GILL NETS.

Species.	Alameda.		Contra Costa.		Del Norte.		Glenn.		Humboldt.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Carp			29,000	$510						
Flounders	5,000	$150	7,000	105					15,458	$455
Herring			2,500	12						
Perch	2,000	180	1,500	60						
Pike, Sacramento			4,600	90						
Salmon:										
Chinook	300	18	1,859,825	95,956	655,000	$14,767	1,300	$95	498,786	19,491
Silver					174,846	3,497			86,072	3,304
Shad, fresh			4,348,640	45,800						
Sharks	65,000	163								
Smelt	12,500	875	2,000	100					24,365	1,014
Steelhead trout									32,405	1,288
Stingray	605,000	1,512								
Striped bass	99,000	7,565	1,036,263	84,676						
Sturgeon									8,010	250
Total	788,800	10,463	7,291,328	227,309	829,846	18,264	1,300	95	665,096	25,802

STATISTICS OF THE YIELD OF THE SHORE FISHERIES OF CALIFORNIA IN 1915, BY COUNTIES, SPECIES, AND APPARATUS—Continued.

BY GILL NETS—Continued.

Species.	Los Angeles.		Marin.		Mendocino.		Monterey.		Orange.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Anchovies	12,585	$130							38,300	$1,732
Barracuda, fresh	565,960	22,032					2,000	$50	1,600	48
Bonito	270,687	7,342								
Flying fish	245	6								
Herring			30,000	$215			23,000	575		
Kingfish	120,891	2,317							51,500	1,030
Mackerel, fresh	47,570	1,372					6,000	30	5,500	165
Perch	35,278	835	10,000	180					850	85
Pompano	14,002	1,400								
Salmon:										
Chinook			6,900	330						
Silver					26,000	$1,040				
Sea bass	146,951	5,584	70,500	3,500			8,800	365	35,200	1,735
Sea trout	400	20								
Smelt	81,316	3,299	65,000	3,125			5,314	425		
Spanish mackerel	73,031	2,970								
Striped bass			23,400	1,865						
Surf fish			3,500	245						
Swordfish	360	8								
Turbot			700	85						
Yellowtail, fresh	162,998	4,539					17,210	129		
Crabs										
Total	1,532,274	52,654	210,000	9,545	26,000	1,040	62,324	1,574	132,950	4,795

Species.	Sacramento.		San Diego.		San Francisco.		San Joaquin.		San Luis Obispo.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Albacore or tuna			2,371	$76						
Barracuda:										
Fresh			1,362,441	39,957					3,000	$120
Salted			198,000	7,900						
Bonito			33,062	594						
Carp	3,000	$40			120,000	$2,400				
Flounders					200,000	600				
Herring					500,000	5,000				
Horse mackerel			295	6						
Kingfish			2,156	50	6,500	200				
Mackerel:										
Fresh			400	8						
Salted			6,450	259						
Perch			217	5	1,450	50				
Pompano			229	27						
Salmon: Chinook	214,346	12,441			136,000	7,500	193,409	$10,030		
Sardines					3,600	250				
Sea bass			261,703	8,351	240,000	12,000				
Sea trout			119	5						
Shad:										
Fresh	16,826	313			1,600,000	9,000	596,820	7,447		
Salted	10,000	125								
Roe	2,940	287					13,898	1,259		
Smelt			115,707	5,597	370,000	15,100			75,000	3,750
Spanish mackerel			9,034	181						
Striped bass	34,554	2,839			283,000	24,000	64,345	5,449		
Sturgeon	620	49					59	5		
Sturgeon roe							22	11		
Yellowtail:										
Fresh			212,645	3,389						
Salted			55,500	1,983						
Total	282,086	16,094	2,260,329	68,388	3,460,550	76,100	868,553	24,201	78,000	3,870

STATISTICS OF THE YIELD OF THE SHORE FISHERIES OF CALIFORNIA IN 1915, BY COUNTIES, SPECIES, AND APPARATUS—Continued.

BY GILL NETS—Continued.

Species.	Santa Barbara.		Santa Cruz.		Solano.		Sonoma.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Barracuda, fresh	162,000	$6,210	5,780	$231				
Bonito	30,000	870						
Herring			890	19				
Kingfish	1,500	30						
Mackerel, fresh	5,000	145						
Perch	1,000	20	6,000	300				
Pike, Sacramento					25	$1		
Pompano			687	68				
Salmon: Chinook					1,179,244	60,524	6,000	$200
Sardines	1,000	20	21,931	220				
Sea bass	50,000	1,900	86,860	3,474				
Sea trout	2,000	80						
Shad, fresh			478	24	176,827	2,650		
Smelt	16,325	865	30,000	1,200				
Spanish mackerel	41,300	826						
Striped bass					208,544	17,787	2,000	160
Sturgeon					2,367	181		
Sturgeon roe					427	250		
Yellowtail, fresh	3,150	88						
Crabs			223,859	15,262				
Total	313,275	11,054	376,485	20,798	1,567,434	81,393	8,000	360

Species.	Sutter.		Tehama.		Yolo.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Albacore or tuna							2,371	$76
Anchovies							12,585	130
Barracuda:								
Fresh							2,137,481	70,282
Salted							198,000	7,900
Bonito							337,349	9,404
Carp					1,000	$15	153,000	2,965
Flounders							227,458	1,310
Flying fish							245	6
Herring							533,390	5,246
Horse mackerel							295	6
Kingfish							154,047	3,472
Mackerel:								
Fresh							104,470	2,555
Salted							6,450	259
Perch							68,945	1,825
Pike, Sacramento							4,625	91
Pompano							15,768	1,580
Salmon:								
Chinook	3,071	$173	1,627	$81	88,560	4,760	4,844,368	226,366
Silver							286,918	7,841
Sardines							26,531	490
Sea bass							900,014	36,909
Sea trout							2,519	105
Shad:								
Fresh	1,245	36	10	1	64,962	1,108	6,805,808	66,379
Salted							10,000	125
Roe	61	6			4,634	434	21,533	1,986
Sharks							65,000	163
Smelt							797,527	35,350
Spanish mackerel							123,365	3,977
Steelhead trout							32,405	1,288
Stingray							605,000	1,512
Striped bass	5,744	407			12,511	883	1,769,161	145,631
Sturgeon			55	3	183	14	11,294	502
Sturgeon roe							449	261
Surf fish							3,500	245
Swordfish							360	8
Turbot							700	85
Yellowtail:								
Fresh							378,793	8,016
Salted							55,500	1,983
Crabs							241,069	15,391
Total	10,121	622	1,692	85	171,850	7,214	20,938,293	661,720

STATISTICS OF THE YIELD OF THE SHORE FISHERIES OF CALIFORNIA IN 1915, BY COUNTIES, SPECIES, AND APPARATUS—Continued.

BY HOOP NETS.

Species.	Del Norte.		Humboldt.		Marin.		San Francisco.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Crabs	26,667	$2,000	24,420	$1,022	168,600	$16,494	929,080	$91,514

Species.	San Mateo.		Sonoma.		Total	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Crabs	4,800	$600	4,000	$300	1,157,567	$111,930
Crawfish			550	265	550	265
Total	4,800	600	4,550	565	1,158,117	112,195

BY POTS AND TRAPS.

Species.	Los Angeles.		Orange.		San Diego.		Santa Barbara.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Perch	1,700	$34						
Rock bass	1,350	54						
Sea bass	7,984	304						
Spiny lobsters	197,074	19,895	16,100	$2,093	480,313	$82,096	158,300	$20,729
Total	208,108	20,287	16,100	2,093	480,313	82,096	158,300	20,729

Species.	Santa Cruz.		Ventura.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Perch					1,700	$34
Rock bass					1,350	54
Sea bass					7,984	304
Octopus	6,000	$600			6,000	600
Spiny lobsters			8,685	$1,129	860,472	125,942
Total	6,000	600	8,685	1,129	877,506	126,934

STATISTICS OF THE YIELD OF THE SHORE FISHERIES OF CALIFORNIA IN 1915, BY COUNTIES, SPECIES, AND APPARATUS—Continued.

BY LINES.

Species.	Alameda.		Colusa.		Humboldt.		Los Angeles.		Marin.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Albacore (or tuna): Fresh							16,518,654	$247,928		
Barracuda: Fresh							36,657	1,362		
Bonito							61,051	1,771		
Carp			500	$35						
Flounders: Fresh					34,775	$1,366	56,700	4,659		
Hake							17,322	571		
Jewfish: Fresh							20,890	414		
"Lingcod": Fresh					2,609	104				
Mackerel							13,010	377		
Pike, Sacramento			400	20						
Rock bass: Fresh							123,367	4,932		
Rockfishes: Fresh					16,905	577	637,031	20,317	3,000	$125
Salmon: Chinook, fresh					381	9				
Sculpin							6,613	263		
Sea bass							337	12		
Sea trout							64	3		
Sharks							2,500	50		
Skates							6,600	120		
Sheepshead							1,367	28		
Smelt	19,000	$1,300								
Sole							10,000	300	50	2
Spanish mackerel							16,250	481		
Striped bass									1,000	100
Yellowtail							106,764	2,969		
Total	19,000	1,300	900	55	54,670	2,056	17,634,577	286,557	4,050	227

Species.	Mendocino.		Monterey.		Orange.		San Diego.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Albacore (or tuna): Fresh					6,000	$150	3,449,560	$51,754
Salted							25,000	481
Barracuda: Fresh					43,500	2,140	53,463	1,164
Salted							2,000	80
Bonito					1,350	40	9,400	180
Flounders: Fresh	13,000	$590	51,000	$1,275	2,900	83	250	10
Salted			9,500	475				
Hake					3,300	107		
Jewfish: Fresh			300	10	4,200	84	87,071	1,271
Salted							50,000	1,500
Kingfish			15,350	383				
"Lingcod:" Fresh	1,000	40	102,000	2,060				
Mackerel							10,405	208
Rock bass: Fresh					53,500	1,337	489,450	10,032
Salted							2,750	97
Rockfishes: Fresh	35,000	1,750	1,306,816	41,818	141,280	4,235	663,464	15,283
Sablefish			17,560	878				
Salmon: Chinook, fresh	80,500	4,190	1,694,660	67,786				
Chinook, salted	20,000	2,400						
Silver	500	20	70,000	2,800				
Sculpin					1,850	75		
Sea bass			4,560	182				
Sea trout					3,500	105		
Sheepshead							201	2
Sole							679	19
Spanish mackerel							40,000	800
Yellowtail							125,253	1,565
Total	150,000	8,990	3,272,746	117,667	261,380	8,356	5,008,946	84,446

STATISTICS OF THE YIELD OF THE SHORE FISHERIES OF CALIFORNIA IN 1915, BY COUNTIES, SPECIES, AND APPARATUS—Continued.

BY LINES—Continued.

Species.	San Francisco.		San Luis Obispo.		San Mateo.		Santa Barbara.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Hake							6,650	$219
Jewfish: Fresh							4,000	80
Kingfish							500	10
"Lingcod": Fresh	301,103	$7,750						
Rock bass: Fresh							4,000	160
Rockfishes: Fresh	825,500	39,655	85,000	$3,400	18,000		24,000	768
Sole	18,858	377						
Octopus	18,682	1,555				$550		
Total	1,164,143	49,337	85,000	3,400	18,000	550	39,150	1,237

Species.	Santa Cruz.		Sonoma.		Ventura.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Albacore (or tuna):							19,974,214	$299,832
Fresh							25,000	481
Salted								
Barracuda:							133,620	4,666
Fresh							2,000	80
Salted							71,801	1,991
Bonito							500	35
Carp								
Flounders:					3,250	$96	161,875	8,079
Fresh							9,500	475
Salted							27,272	897
Hake								
Jewfish:							116,461	1,859
Fresh							50,000	1,500
Salted							48,607	1,375
Kingfish	32,757	$982						
"Lingcod:"							508,412	13,014
Fresh	98,000	2,940	2,700	$120			3,500	175
Salted	3,500	175					23,528	591
Mackerel	113	6					400	20
Pike, Sacramento								
Rock bass:							670,317	16,461
Fresh							2,750	97
Salted								
Rockfishes:							4,160,824	141,202
Fresh	378,478	12,355	22,000	1,110	4,350	259	8,000	400
Salted	8,000	400					19,783	989
Sablefish	2,223	111						
Salmon:							1,907,133	77,128
Chinook, fresh	119,592	4,783	12,000	360			20,000	2,400
Chinook, salted							100,397	4,015
Silver	29,897	1,195					8,813	345
Sculpin	350	7					4,897	194
Sea bass							3,564	108
Sea trout							2,500	50
Sharks							6,000	120
Skates							1,568	30
Sheepshead							19,000	1,300
Smelt							29,587	698
Sole							56,250	1,281
Spanish mackerel							2,600	217
Striped bass	350	17	1,250	100			232,017	4,534
Yellowtail							18,682	1,555
Octopus								
Total	673,260	21,971	37,950	1,690	7,600	355	28,431,372	588,194

STATISTICS OF THE YIELD OF THE SHORE FISHERIES OF CALIFORNIA IN 1915, BY COUNTIES, SPECIES, AND APPARATUS—Continued.

BY DREDGES, TONGS, RAKES, FORKS, ETC.

Species.	Alameda.		Del Norte.		Humboldt.		Los Angeles.		Marin.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Clams:										
Hard	.....	.....	.....	.....	1,760	$427	296	$104	26,416	$7,070
Soft	21,250	$5,950	.....	.....	6,280	1,250	.....	.....	11,880	4,422
Oysters:										
Eastern, market	.....	.....	.....	.....	42	14	.....	.....	14,840	8,814
Native, market	.....	.....	.....	.....	.....	.....	.....	.....	8,435	6,513
Mussels	130	35	2,650	$180	.....	.....	4,820	578	120	8
Turtles	.....	.....	.....	.....	.....	.....	184	9	.....	.....
Total	21,380	5,985	2,650	180	8,082	1,691	5,300	691	61,691	26,827

Species.	Mendocino.		Monterey.		Orange.		San Francisco.		San Luis Obispo.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Clams:										
Hard	.....	.....	96	$25	800	$260	.....	.....	34,856	$9,150
Soft	.....	.....	.....	.....	.....	.....	23,000	$5,300	.....	.....
Oysters:										
Eastern, market	.....	.....	.....	.....	.....	.....	360,892	156,745	.....	.....
Mussels	3,500	$200	1,810	110	.....	.....	6,000	1,200	.....	.....
Seaweed	.....	.....	3,799	190	.....	.....	.....	.....	.....	.....
Total	3,500	200	5,705	325	800	260	389,892	163,245	34,856	9,150

Species.	San Mateo.		Santa Barbara.		Santa Cruz.		Sonoma.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Clams:										
Hard	.....	.....	.....	.....	1,032	$272	600	$275	65,856	$17,583
Soft	2,200	$700	.....	.....	.....	.....	2,550	485	67,160	18,107
Oysters:										
Eastern, market	.....	.....	.....	.....	.....	.....	.....	.....	375,774	165,573
Native, market	.....	.....	.....	.....	.....	.....	.....	.....	8,435	6,513
Mussels	.....	.....	.....	.....	210	15	.....	.....	19,240	2,326
Turtles	.....	.....	.....	.....	.....	.....	.....	.....	184	9
Seaweed	.....	.....	3,000	$135	.....	.....	.....	.....	6,799	325
Total	2,200	700	3,000	135	1,242	287	3,150	760	543,448	210,436

BY LAMPARA NETS.

Species.	Los Angeles.		Monterey.		Orange.		San Francisco.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Albacore (or tuna)	2,760	$69	.....	.....	.....	.....	.....	.....	2,760	$69
Anchovies:										
Fresh	.....	.....	.....	.....	.....	.....	36,000	$225	36,000	225
Salted	.....	.....	16,000	$1,600	.....	.....	.....	.....	16,000	1,600
Barracuda	268,597	9,476	.....	.....	.....	.....	5,000	200	273,597	9,676
Bonito	20,261	688	.....	.....	.....	.....	.....	.....	20,261	688
Croaker	3,150	65	.....	.....	.....	.....	.....	.....	3,150	65
Herring	.....	.....	1,000	20	.....	.....	.....	.....	1,000	20
Kingfish	209,864	6,197	.....	.....	.....	.....	5,200	150	215,064	6,347
Mackerel	94,291	2,732	.....	.....	12,000	$240	.....	.....	106,291	2,972
Pompano	1,688	168	.....	.....	.....	.....	1,335	200	3,023	368
Rock bass	133,617	5,345	.....	.....	90,000	2,250	.....	.....	223,617	7,595
Sardines	305,150	6,103	2,906,200	14,531	22,500	225	12,000	75	3,245,850	20,934
Sea bass	197,892	7,520	.....	.....	.....	.....	5,000	200	202,892	7,720
Smelt	11,771	625	.....	.....	.....	.....	3,000	150	14,771	775
Spanish mackerel	143,905	4,114	.....	.....	.....	.....	.....	.....	143,905	4,114
Whitebait	.....	.....	.....	.....	.....	.....	5,000	200	5,000	200
Yellowtail	286,806	8,030	.....	.....	73,500	2,205	.....	.....	360,306	10,235
Squid	21,325	426	6,000,000	30,000	.....	.....	50,000	1,500	6,071,325	31,926
Total	1,701,077	51,558	8,923,200	46,151	198,000	4,920	122,535	2,900	10,944,812	105,529

STATISTICS OF THE YIELD OF THE SHORE FISHERIES OF CALIFORNIA IN 1915, BY COUNTIES, SPECIES, AND APPARATUS—Continued.

BY PARANZELLA NETS.

Species.	Los Angeles.		Santa Cruz.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Flounders	383,970	$13,063	588,135	$16,936	972,105	$29,999
Hake			26,030	260	26,030	260
Kingfish			99,500	2,985	99,500	2,985
"Lingcod"			14,600	438	14,600	438
Sablefish			4,600	230	4,600	230
Skate			600	6	600	6
Sole	9,692	291	1,553,200	43,830	1,562,892	44,121
Octopus			5,000	400	5,000	400
Total	393,662	13,354	2,291,665	65,085	2,685,327	78,439

BY TRAMMEL NETS.

Species.	Los Angeles.		Marin.		Orange.		San Diego.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Barracuda	182,248	$7,050						
Flounders	635,748	24,919			132,250	$6,308	2,100,908	$81,413
Perch			2,500	$75				
Total	817,996	31,969	2,500	75	132,250	6,308	2,100,908	81,413

Species.	Santa Barbara.		Ventura.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Barracuda					182,248	$7,050
Flounders	115,500	$3,855	8,000	$258	2,992,406	116,753
Perch					2,500	75
Total	115,500	3,855	8,000	258	3,177,154	123,878

BY FYKE NETS.

Species.	Colusa.		Sacramento.		San Joaquin.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Carp			40,201	$514		
Catfish	6,700	$264	91,646	3,888	311,787	$15,533
Hardhead			42,237	2,122		
Pike, Sacramento			4,887	171		
Split-tails			15,475	328		
Suckers			635	15		
Total	6,700	264	195,081	7,038	311,787	15,533

Species.	Sutter.		Yolo.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Carp	2,000	$25	3,426	$56	45,627	$595
Catfish	17,346	725	39,316	1,719	466,795	22,129
Hardhead	224	16	21,923	914	64,384	3,052
Pike, Sacramento	523	19	450	18	5,860	208
Split-tails					15,475	328
Suckers					635	15
Total	20,093	785	65,115	2,707	598,776	26,327

STATISTICS OF THE YIELD OF THE SHORE FISHERIES OF CALIFORNIA IN 1915, BY COUNTIES, SPECIES, AND APPARATUS—Continued.

BY ABALONE OUTFITS.

Species.	Marin.		Mendocino.		Monterey.		San Diego.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Abalone:								
Alive			3,035	$97				
Meat	4,550	$158	3,000	185	547,424	$10,939	57,000	$3,168
Shells	2,000	450					72,000	1,440
Pearls and blisters		40						
Total	6,550	648	6,035	282	547,424	10,939	129,000	4,608

Species.	Santa Cruz.		Sonoma.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Abalone:						
Alive	20,991	$420			24,026	$517
Meat			119,000	$2,380	730,974	16,830
Shells					74,000	1,890
Pearls and blisters				1,200		1,240
Total	20,991	420	119,000	3,580	829,000	20,477

BY MISCELLANEOUS APPARATUS.

Species.	Alameda.		Humboldt.		San Francisco.		Santa Barbara.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Surf fish			20,000	$600				
Shrimp	263,000	$4,850			35,000	$700		
Sea lion							9,375	$4,120
Total	263,000	4,850	20,000	600	35,000	700	9,375	4,120

Species.	Shasta.		Sonoma.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Salmon: Chinook	750	$75			750	$75
Surf fish			37,000	$1,720	57,000	2,320
Shrimp					298,000	5,550
Sea lion					9,375	4,120
Total	750	75	37,000	1,720	365,125	12,065

WHOLESALE FRESH-FISH TRADE.

San Francisco is by far the most important wholesale fresh-fish center in California. Large quantities of fresh fish are also handled by firms located in Los Angeles, Monterey, San Diego, and Sacramento, but a considerable proportion of these fish eventually reach San Francisco, from which city many are shipped to adjoining States to the east and north. In 1915 there were 64 wholesale fresh-fish establishments in the State, valued at $687,156, with a cash capital of $202,500, in which 394 persons were engaged and $310,897 paid in wages.

FISHERY PRODUCTS PREPARED, EXCLUSIVE OF CANNING.

The preparation of various fishery products has an important bearing on the fisheries of California. Squid, amounting to 1,200,000 pounds, were dried and sold for $51,000. The mild-cured products

in 1915 consisted of 1,761,300 pounds of chinook salmon, valued at $187,220, and 105,000 pounds of shad, valued at $5,250. Chinook salmon, amounting to 245,000 pounds, were pickled and sold for $26,950. The salt-fish products amounted to 5,023,982 pounds, with a value of $83,138, the greater part of which was shad. The smoking of fish was comparatively unimportant, the output being only 34,600 pounds, with a value of $4,203. These consisted of halibut, chinook salmon, albacore, herring, and sablefish in the order of their importance. Among other products prepared from fish and fish offal were 599 tons of poultry feed, valued at $29,360; 65,567 gallons of oil, valued at $19,548; and 396 tons of fertilizer, valued at $14,145.

For statistics of products prepared, exclusive of canning, in California in 1915, see table, page 54.

CANNING INDUSTRY.

In 1915 there were 21 establishments, valued at $1,443,613, engaged in the canning of various fishery products. The number of persons engaged was 2,676, and the wages paid amounted to $394,181. Among the more important species canned were albacore, or tuna, sardines, chinook and silver salmon, shad, shad roe, bonito, and yellowtail. The value of the tuna pack, however, far exceeds that of all the other products combined. The canning of tuna, bonito, and yellowtail is confined to Los Angeles and San Diego Counties. Sardines, shad, and shad roe were canned in Contra Costa County only by one firm. Salmon were packed in Contra Costa, Solano, and Monterey Counties. Considerable quantities of abalone were canned in San Diego and Monterey Counties. A few cases of rockfishes were canned in San Diego and Los Angeles Counties, and a small pack of mussels was put up in Del Norte County.

EXTENT OF THE CANNING INDUSTRY OF CALIFORNIA IN 1915.

Items.	Number.	Value.
Establishments	21	$1,443,613
Cash capital		253,727
Persons engaged	2,676	
Wages paid		394,181
PRODUCTS.[a]		
Bonito:		
1 pound flat ....cases..	145	725
½ pound flat....do....	2,403	15,861
Salmon:		
Chinook—		
1 pound tall....do....	1,048	4,192
1 pound flat....do....	15,994	85,201
½ pound flat....do....	2,466	19,998
Salmon—Continued.		
Silver—		
1 pound tall.....cases..	290	$1,044
1 pound flat.....do....	2,500	11,250
½ pound flat.....do....	788	4,097
Albacore (tuna):		
1 pound flat.....do....	131,764	647,003
½ pound flat.....do....	110,602	751,741
¼ pound flat.....do....	6,045	45,340
⅛ pound flat.....do....	10,016	73,774
Yellowtail:		
1 pound flat.....do....	465	2,748
½ pound flat.....do....	1,177	8,661
Oysters (not cooked)...galls..	29,429	75,804
Miscellaneous.....cases..	60,718	357,129

[a] All cases are on a basis of 48 pounds each.

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